POPULAR SCIENCE

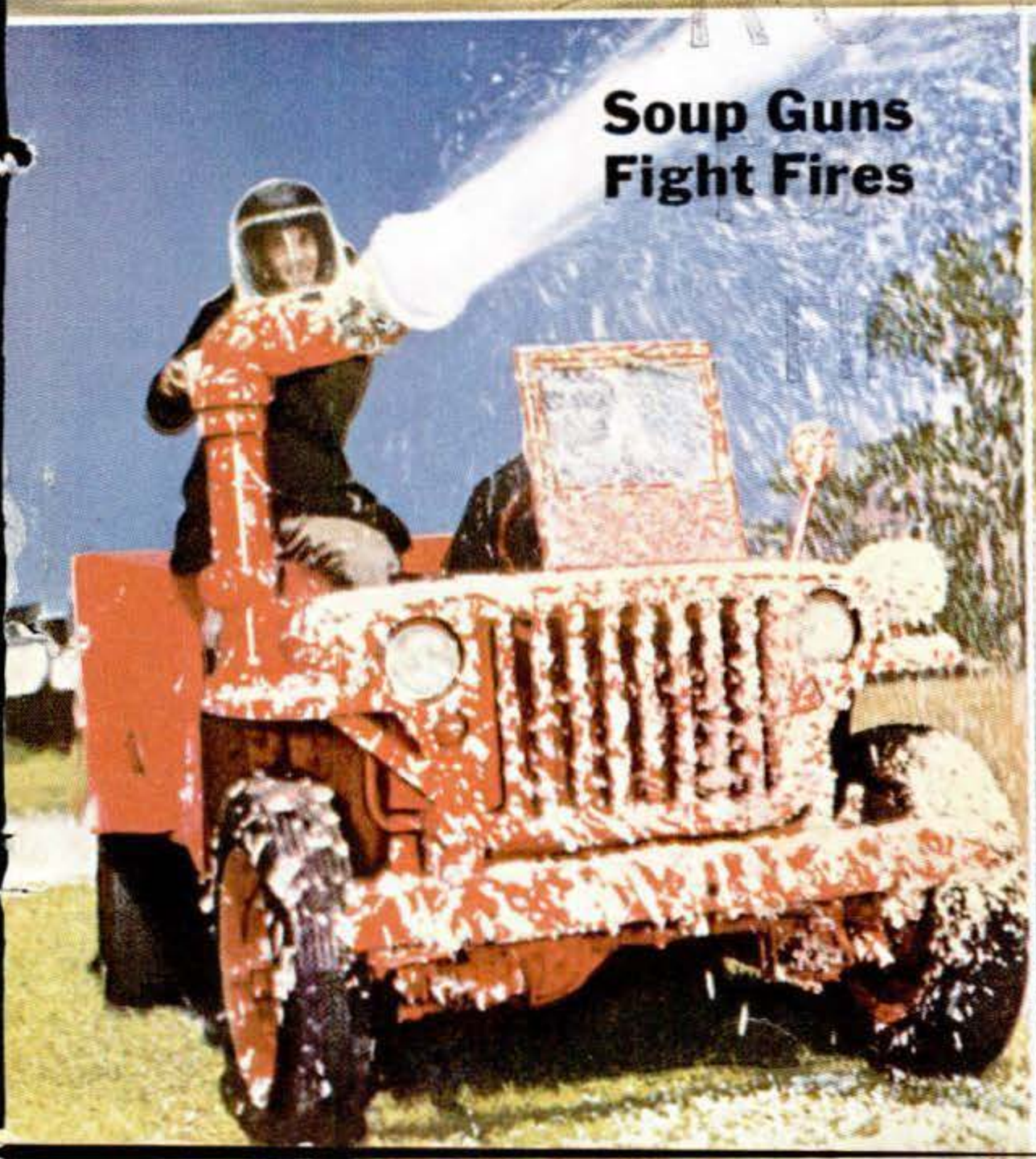
MONTHLY

MECHANICS - AUTOS - HOMEBUILDING

Why Not Put Engines in Back? PAGE 116

25¢
March

Spruce Up Now for Spring PAGE 179



Soup Guns Fight Fires

Dream Motorcycle Cost $5,000

How Any Car Owner With "HANDY GUIDE

Shows 101 Ways to SAVE MONEY!
On Gas — Oil — Tires — Insurance
Repairs — Service — Beautifying —
Buying – Selling – Trading-in – and More!

General Editor! Frank Mitchell, famous as car owner's friend and instructor in auto repair, heads staff of practical writers and artists who make contents easy to follow.

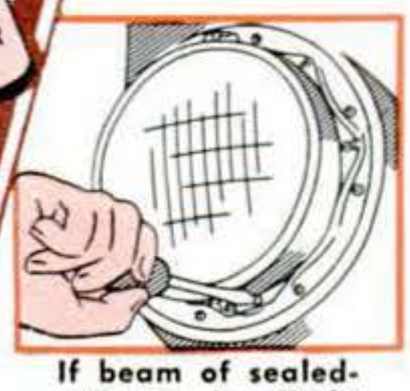
HERE IT IS! The *first* book **ever** published with the primary purpose of telling everything the average car owner needs to know to SAVE MONEY — to keep his car purring like a kitten.

This brand-new, never-before-published book is NOT a collection of complicated diagrams and highly technical facts and figures for the mechanical wizard. It IS an exciting picture-filled book crammed with easy step-by-step instructions and common sense guidance which you can understand and use *right away* to SAVE MONEY!

If you're an average car owner, driving 6000 to 10,000 miles a year, you spend about $400.00 for Gas, Oil, Summerizing, Winterizing, Repair Bills, Periodic Servicing, Tires, Insurance, *etc.* This amazing NEW book shows you how to SAVE at least $100.00 of that figure — not for just one year — but EVERY year! Big savings even for drivers who don't touch tools!

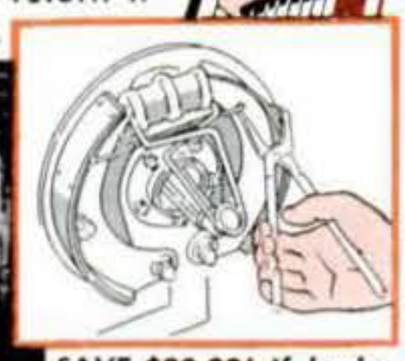
Enjoy Week's Trial
FREE
Under this Amazing Savings Guarantee!

Test book 7 days at our expense. If not convinced it will help you save $100.00 a year, return it and owe nothing.



If beam of sealed-reflector headlight goes out, you may not need costly new unit. Corroded contacts may be preventing lamp from lighting. To restore light, merely clean contacts.

Unsightly fender dents are easily removed, sometimes pop right out after few taps from hammer. Just one of scores of repair jobs any amateur can easily do.



SAVE $20.00! If brake pedal is hard to press, goes down to floor, brakes squeak, you need brake adjustment or relining. Book explains steps. *(Here)* How to remove pull back spring from shoe. Book shows 101 ways to Save Money — even if you don't touch tools.

SAVE $3.00 to $4.00! Install fuel pump yourself. Tilt as shown and position pump arm so it will ride in proper place on camshaft.

SAVE by cleaning air filter. Remove filter element as shown, wash in gasoline, dip in engine oil, drain and replace. Check cleaner every 1000 miles. Cleaning oil and gas filters is just as easy.

512 Big Double-Column Pages, of Step-by-Step Instructions Anyone Can Understand!

101 Ways to Save on Service, Maintenance, and Repair of Your Car!

Book Crammed with Show-How Pictures, Charts, Diagrams!

Full Library-Size — In Sturdy Washable Binding

Here's Partial List of Vast

More Miles for Less Gas

20 Sure Ways to Get More Gas Mileage
How to Remove, Clean Out and Replace Gas Tank
Adjust Carburetor
How to Repair Clogged Line
And Lots MORE!

Body and Fender

How to Repair Dents, Match Colors, Touch Up Paint, Treat Surface Scratches, Rust Spots, Etc.
How to Give Car Mirror-Like Finish
And Much MORE!

Lubrication

10 Sure Ways to Save Oil
How to Prevent Oil Dilution
How to Trace and Correct Leaks
How to Install Oil Pump Line
Undercoating
And MORE!

Save on Tires

14 Common Sense Ways to Get More Mileage on Tires
Blowout Protection
How to Cross-Switch Tires
Wheel Balance, Front End Checks
And Much MORE!

Specifications

For Every Popular Make Car — As Far Back as 1935!

Rely on Brakes

How to Make Fast Brake-Safety Test
How to Adjust and Re-Line Brakes
Lots MORE!

Auto Insurance

Everything Average Car Owner Needs to Know about All Types
And Much MORE!

Learn the Easy Best Way to:

ADD up to $300.00 to Resale Price of Car. How to Get a Better Deal on Trade-In!
TRACE Cause of Starting Troubles Fast!
TIGHTEN Loose Steering, Correct Wobbly Wheels. Safeguard Your Life and Those Who Ride with You!
KEEP Car "Tuned-Up" to Smooth Running Performance — Whether New or Old!
GIVE Your Car Faster Pick-Up and "Go"
PROTECT Engine Parts from Rust and Corrosion. Clean Gas, Oil, Water Lines.
BEWARE of "Miracle Gas and Oil Savers" on Market. Some May be Harmful to Car!
SAVE $15.00 Winterizing, Summerizing!
SAVE $40.00! Hammer Out Dents Yourself!
SAVE $1.00 Installing New Fan Belt!
SAVE up to $90.00 on Ring, Valve and Bearing Job!
SAVE $100.00 on Service, Maintenance and Running of Your Car — Even if You Make No Repairs Yourself!

Interior Beauty

How to Re-upholster, Make Seat Covers, Remove Stains
Dashboard Instruments: Assembly, Repair, Disassembly
And Lots MORE!

Exhaust System

Disassembly, Adjustment and Assembly of: Muffler, Exhaust Pipe, Manifold Pipe
How to Repair Leak from Exhaust or Intake Manifolds
And Lots MORE!

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the Aid of

FOR CAR OWNERS"

How to Get 2 to 5 More Miles on a Gallon! Up to Double Mileage on Tires! Do Your Own Repairs! Add Longer Life, Greater Value, More Power! *No Magic Miracles! Just Plain Common Sense!*

Car owner making one-minute adjustment of carburetor idling screw for more gas mileage. He will also clean spark plugs and set points to prescribed clearance. Then by following simple gas-saving driving rules and other common sense ways to save on gas, he'll save up to $50.00 a year on gasoline alone!

A Few of the 101 Ways Book Helps You SAVE

SAVE up to $50.00 on Gas! Learn 20 SURE WAYS to get from 2 to 5 *more* miles on every gallon!

SAVE on Oil! 11 ways show how to save up to 50% on oil bills!

SAVE on Tires! 14 common sense ways show you how!

SAVE on Auto Insurance! Everything you need to know about all types. How to Collect Faster!

SAVE on Repair Bills! Book's basic know-how helps you service and repair every popular make car — as far back as 1935 models.

SAVE — Even if You Make No Repairs Yourself! Book lists fair price mechanic should charge for over 100 repair and service jobs. Protects you from bill padding and overcharging!

SAVE When Buying Used Car! CHECK LIST shows you, point by point, how to tell good sound car from "lemon." Takes the gamble out of used car buying.

SEE Contents Below for More Ways book shows how to SAVE MONEY!

Price Slashed IN HALF to Win New Friends!

Where other publishers might charge about $6.00 for a comparable book, WISE SLASHES that figure in half — to only $2.95.

But first, week's FREE Trial must convince you book will help you save at least $100.00 a year — EVERY year — or return it and owe nothing. Send NO money. *Mail FREE-Trial Coupon NOW!*

Even an amateur can patch muffler with aid of book's "1-2-3" directions. Clean area, place steel patch over hole and seal.

Save on Auto Insurance! Best type to carry; recommended amount; how to collect damages without red tape; *much more!*

SAVE $10.00 to $25.00 towing fees! TROUBLE SHOOTER Section helps you trace trouble fast — fix it right and quick. Make many on-the-road emergency repairs in minutes. Avoid time-wasting layovers at unknown garages along the road.

Beautify inside to look like new! Book shows how to re-upholster, refinish, remove stains, make seat covers, etc. Enjoy that feeling of satisfaction in knowing your car looks as spic and span inside and out as a shiny new showroom model. With book's how-to guidance, you can make *your* car look better, run better, last longer! Mail FREE-Trial Coupon Now!

Money-Saving Contents Crammed into Book!

Engine Tune-Up

Testing; Adjusting; Cleaning; Using Solvent; Battery; Wiring; Vacuum Advance; Firing Order; Spark Plugs; Points, Carburetion; Automatic Choke, Generator
And Lots MORE!

Cooling System

How to Repair Clogged Radiator; Leaky Water Pump; Broken Thermostat
Installing Fan Belt
How to Winterize, Summerize
Anti-Freeze Tips
And So Much MORE!

For faster pick-up, smoother riding and more gas mileage, clean and adjust distributor points several times a year. Book shows how.

Auto Wiring

Battery Care
How to Repair Shorts and Breaks
How to Repair or Replace Heaters
Directional Signals, Headlights, Inside Lights
And Lots MORE!

Front End Repair

Disassembly, Adjustment and Assembly of: King Pins, Pitman Arm, Front Wheels, Shock Absorbers, Transmission, Etc.
And Lots MORE!

TROUBLE-SHOOTER SECTION Shows You How to Correct All 64 Most Common Car Troubles Fast and Easy!

How many of these troubles are robbing you of top performance and enjoyment from your car? Engine Won't Start — Misses — Knocks — Overheats — Backfires — Stalls Frequently — Gears Grind — Car Pulls to One Side — Annoying Squeaks — Strange Noises — Sluggish Pick-Up — Horn Keeps Blowing — Defroster Doesn't Clear Windshield — Etc., Etc.

Big, handy TROUBLE-SHOOTER SECTION shows you how to quickly locate and correct these and *all 64* most common car troubles — without paying high labor costs. Especially valuable when making on-the-road repairs. Save high towing charges and repair bills from strange garages.

Steer Clear of Trouble

How Much Play Is Too Much?
How to Tighten Loose Steering; Adjust Wheel Alignment
And Much MORE!

Rear End Repairs

Disassembly, Adjustment and Assembly of: Rear Wheels, Drums, Axle, Bearing, Universals, Etc.
And Much MORE!

Major Engine Repair

Disassembly, Adjustment and Assembly of: Connecting Rod Bearings and Main Bearings
How to Remove and Replace: Piston Rings, Cylinder Head, Crankcase, Hoses and Gaskets, Removing Carbon
And Much MORE!

Valves

Disassembly, Adjustment and Assembly of: Valve Plates, Valves (in Block), Overhead Valves, Valve Springs
Valve Timing
Valve Grinding
Tappet Clearance
Sticking or Leaky Valves
And Lots MORE!

Other Engine Repair

How to Repair Leak in Head Gasket
Replace Fuel Pump
Adjust, Repair, Replace Carburetor
Spark Plugs: How to Test, Clean, Replace and Get Correct Clearance
How to Test Piston Rings, Ignition
And Much MORE!

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POPULAR SCIENCE

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Mechanics and Handicraft

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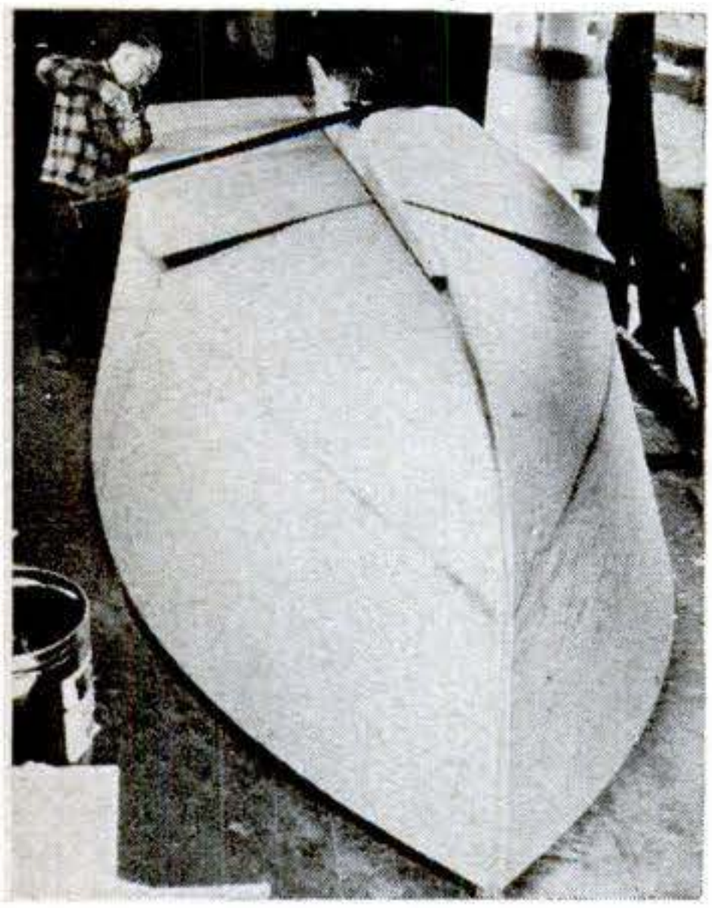
MARCH, 1953

Everybody's Building Kit Boats



***One boat kit** and a few simple tools, plus a little patience and a few weekends of work—and you can be the proud skipper of your own boat. For short cuts in assembling these kits, the tools you'll need and some of the kits available, see page 183.*

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Godfrey Hammond, PUBLISHER • Stephen P. Glennon, ADVERTISING DIRECTOR

ADVERTISING OFFICES: NEW YORK—353 Fourth Ave.; CHICAGO—360 North Michigan Ave.; DETROIT—820 Book Bldg.; SAN FRANCISCO—681 Market St.; CLEVELAND—328 Citizens Bldg.; LOS ANGELES—2550 Beverly Blvd.
EDITORIAL OFFICES: 353 Fourth Avenue, New York 10, N. Y.

Published monthly at 353 Fourth Avenue, New York 10, N. Y., by Popular Science Publishing Co., Inc., Godfrey Hammond, President and Treasurer; R. C. Wilson, Stephen P. Glennon, Vice-Presidents; F. W. Briggs, Secretary. Entered as second-class matter Dec. 28, 1918, re-entered as second-class matter July 26, 1948, at the Post Office in New York, N. Y., under the act of March 3, 1879; additional entry as second-class matter at Dayton, Ohio. Entered as second-class matter at the Post Office Department, Canada. Printed in U.S.A. Copyright, 1953, by Popular Science Publishing Co., Inc. All rights reserved in the United States, Great Britain, and in all countries participating in the International Copyright Convention and Pan-American Copyright Convention. Yearly subscriptions to United States, its possessions and Canada, $3.00 (2 years, $5.50; 3 years $7.50); foreign countries $1 per year extra. Four weeks' notice is needed to change a subscriber's address. Please give both old and new addresses, including postal zone numbers.

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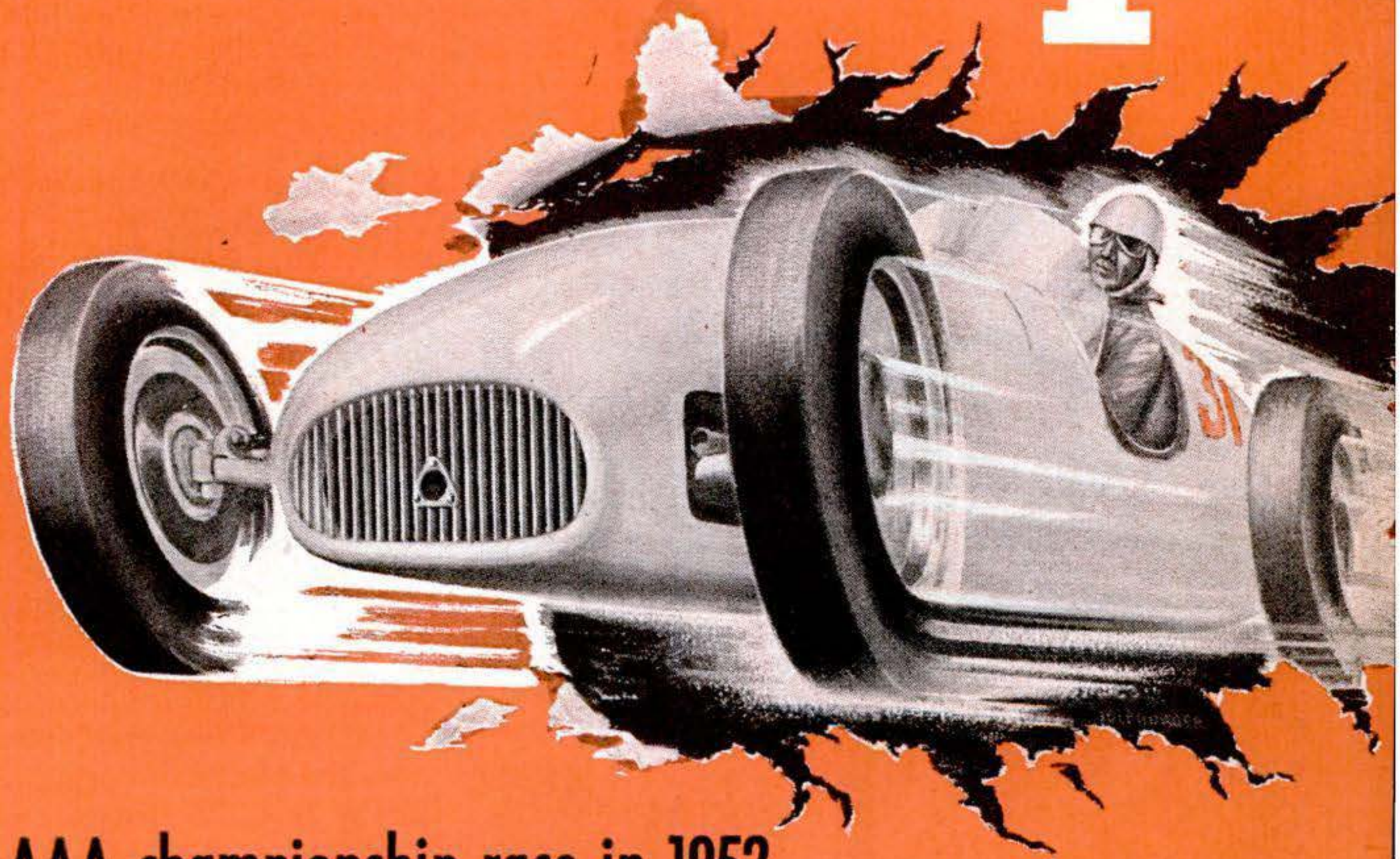
clean sweep!



Every AAA championship race in 1952 was won by a car equipped with

These were the winning drivers ... the winning rings were Perfect Circles!

May 30	Indianapolis, Ind.	500 Miles	Troy Ruttman
June 8	Milwaukee, Wis.	100 Miles	Mike Nazaruk
July 4	Raleigh, N. C.	200 Miles	Troy Ruttman
Aug. 16	Springfield, Ill.	100 Miles	Bill Schindler
Aug. 24	Milwaukee, Wis.	200 Miles	Chuck Stevenson
Aug. 30	Detroit, Mich.	100 Miles	Bill Vukovich
Sept. 1	DuQuoin, Ill.	100 Miles	Chuck Stevenson
Sept. 1	Pikes Peak, Colo.		George Hammond
Sept. 6	Syracuse, N. Y.	100 Miles	Jack McGrath
Sept. 8	Denver, Colo.	100 Miles	Bill Vukovich
Nov. 2	San Jose, Calif.	100 Miles	Bobby Ball
Nov. 11	Phoenix, Ariz.	100 Miles	Johnny Parsons

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Mister—can your hair pass the CARESS TEST?

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Do you shrink from that moment when she runs her fingers through your hair—afraid she'll find it oily? Then switch today to Mennen Cream Hair Oil. Lightly blended—leaves no trace. Contains lanolin. Helps remove dandruff scales, relieve dry scalp. Get it today—pass her Caress Test tonight!

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NEXT MONTH . . .

18th-Century Coach Gets 20th-Centuryized

Britain's gilded State Coach, which will carry Queen Elizabeth to her coronation next June, is getting the sprucing-up of its 200 years. POPULAR SCIENCE for April will show how artisans are giving it a delicate face-lift and fitting the four-ton, eight-horsepower vehicle, for the first time, with such accessories as rubber tires and electric lights.

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I.C.S. student J. R. Todd's pay increased $120 per mo.

I.C.S. student Patrick Ross, Jr., became Gen'l Supt. of construction company.

I.C.S. student S. C. Traegde rose from farm laborer to Senior Research Chemist.

I.C.S. student H. A. Howell got job paying $100 a month more.

I.C.S. student W. K. Watson changed jobs twice — for higher pay each time.

WHO ELSE

Wants to Get Ahead Faster This Famous Way?

I.C.S. student F. G. Brigham, promoted to Assistant Treasurer of his firm.

I.C.S. student H. D. Fowler became a famous inventor.

I.C.S. student M. A. Duford was appointed Loom Fixer before completing course.

I.C.S. student D. Kieffer rose from coal-passer to Engineer of power plant.

I.C.S. student R. F. Lee, rose to Advertising Promotion Mgr. of large corporation.

I.C.S. student F. Bachtik's pay rose from $152 to $395 per month.

I.C.S. student P. E. Barber now owns his own business.

I.C.S. student W. L. McCurdy became Station Electrician of giant Hydro-Electric Substation.

I.C.S. student C. T. Baker became well-known Consulting Engineer.

I.C.S. has 14 file cases crammed with success stories of I.C.S. students like those shown here! In fact, a recent Survey showed that—*in one single 120-day period* —1973 I.C.S. students were promoted to better jobs!

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- ☐ Auto-Elec. Technician
- ☐ Auto Body Rebuilding and Refinishing
- ☐ Diesel—Gas Engines

AVIATION
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- ☐ Aircraft Engine Mechanic
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BUILDING
- ☐ Architecture
- ☐ Arch. Drafting
- ☐ Building Contractor
- ☐ Estimating
- ☐ Carpenter and Mill Work
- ☐ Carpenter Foreman
- ☐ Reading Blueprints
- ☐ House Planning
- ☐ Plumbing
- ☐ Heating
- ☐ Steam Fitting
- ☐ Air Conditioning
- ☐ Electrician

BUSINESS
- ☐ Business Administration
- ☐ Certified Public Accountant
- ☐ Accounting
- ☐ Bookkeeping
- ☐ Stenography and Typing
- ☐ Secretarial
- ☐ Federal Tax
- ☐ Business Correspondence
- ☐ Personnel and Labor Relations
- ☐ Advertising
- ☐ Retail Business Management
- ☐ Managing Small Business
- ☐ Sales Management
- ☐ Salesmanship
- ☐ Traffic Management

CHEMISTRY
- ☐ Chemical Engineering
- ☐ Chemistry
- ☐ Analytical Chemistry
- ☐ Petroleum—Nat'l Gas
- ☐ Pulp and Paper Making
- ☐ Plastics

CIVIL, STRUCTURAL ENGINEERING
- ☐ Civil Engineering
- ☐ Structural Engineering
- ☐ Surveying and Mapping
- ☐ Structural Drafting
- ☐ Highway Engineering
- ☐ Reading Blueprints
- ☐ Concrete Construction
- ☐ Sanitary Engineering

DRAFTING
- ☐ Aircraft Drafting
- ☐ Architectural Drafting
- ☐ Electrical Drafting
- ☐ Mechanical Drafting
- ☐ Structural Drafting
- ☐ Sheet Metal Drafting
- ☐ Mine Surveying and Drafting

ELECTRICAL
- ☐ Electrical Engineering
- ☐ Electrician
- ☐ Electrical Maintenance
- ☐ Electrical Drafting
- ☐ Electric Power and Light
- ☐ Lineman

HIGH SCHOOL
- ☐ High School Subjects
- ☐ College Preparatory
- ☐ Mathematics
- ☐ Commercial
- ☐ Good English

MECHANICAL AND SHOP
- ☐ Mechanical Engineering
- ☐ Industrial Engineering
- ☐ Industrial Supervision
- ☐ Foremanship
- ☐ Mechanical Drafting
- ☐ Machine Design-Drafting
- ☐ Machine Shop Practice
- ☐ Tool Design
- ☐ Industrial Instrumentation
- ☐ Machine Shop Inspection
- ☐ Reading Blueprints
- ☐ Toolmaking
- ☐ Gas—Electric Welding
- ☐ Heat Treatment—Metallurgy
- ☐ Sheet Metal Work
- ☐ Sheet Metal Pattern Drafting
- ☐ Refrigeration

POWER
- ☐ Combustion Engineering
- ☐ Diesel—Electric
- ☐ Electric Light and Power
- ☐ Stationary Steam Engineering
- ☐ Stationary Fireman

RADIO, TELEVISION, COMMUNICATIONS
- ☐ General Radio
- ☐ Radio Operation
- ☐ Radio Servicing—FM
- ☐ Television
- ☐ Electronics
- ☐ Telephone Work

RAILROAD
- ☐ Locomotive Engineer
- ☐ Diesel Locomotive
- ☐ Air Brakes ☐ Car Inspector
- ☐ Railroad Administration

TEXTILE
- ☐ Textile Engineering
- ☐ Cotton Manufacture
- ☐ Rayon Manufacture
- ☐ Woolen Manufacture
- ☐ Loom Fixing
- ☐ Finishing and Dyeing
- ☐ Textile Designing

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- ☐ Tea Room Management

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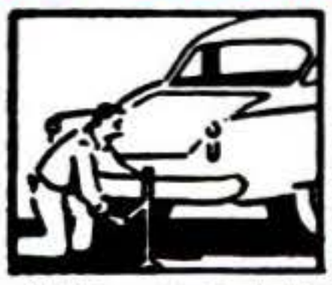
Here at last—after long careful preparation—the latest 1953 automotive manual that shows you how to save $$$ on gas, tires, repairs, accessories. This amazing book, hot off the presses is the NEWEST now available in America! It gives you the down-to-earth facts on how to get 30, 40, 50 miles on a single gallon of gas. No longer need you get rattled to see "tin can jaloppies" beat you at the light everytime . . . leave you in the dust on the highway! Now you can give your car greater pep, add up to 30 miles per hour to its top speed, surge ahead from 0 to 60 miles in 12 seconds flat. You can save hundreds of dollars annually, burn water with gas, extend car life by simple easy tricks, quickly recondition cylinder walls without removing the motor! It seems incredible but it's true! Many of these methods have been tested by huge industrial and oil firms, special laboratories, government bureaus. Some are used by the Army, Navy and Air Force. Some have come from the Indianapolis Speedway champions. Now this information is yours in the new 1953 book: "HIGH SPEED & EXTRA POWER"—hot off the presses.



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Do you need help to stop power waste? A quarter's worth of graphite will work wonders for you! This method used by thousands. Try it . . . you'll be amazed! There's over 1000 more ideas for you—easy to understand with pictures that show you how! Busy executives or ladies can let their service station or attendant make many changes shown in this book. Most fellows, however, prefer to have the fun and satisfaction of doing it themselves. After all it's so simple with the easy instructions & step-by-step pictures! Remember, you must be satisfied or this manual costs you nothing!

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You Get Valuable, Practical Experience Using My Kits. All Equipment Yours to Keep.

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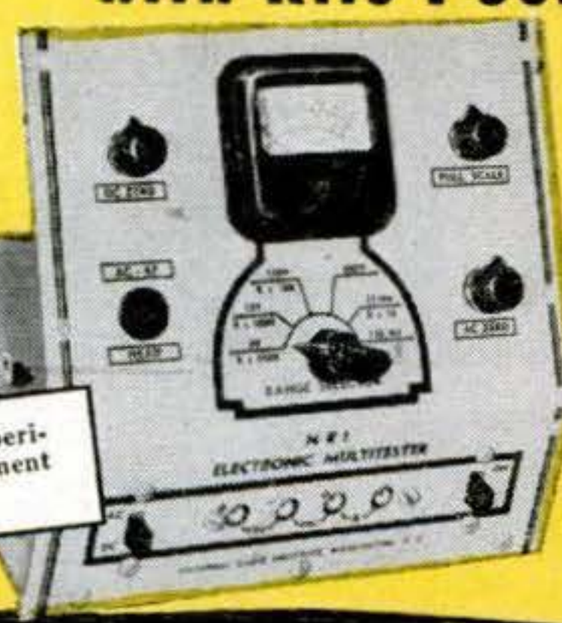

Build This Tester

You build this Multitester from parts I send, use it to earn extra money in your spare time fixing neighbors' Radios. I also send you speaker, tubes, chassis, transformer, loop antenna, everything you need to build a modern Radio and other equipment. You get practical experience working with circuits common to both Radio and Television. All equipment is yours to keep. See and read about it in my FREE 64-page book. Just cut out and mail coupon below!

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"I am becoming an expert Teletrician as well as Radiotrician. Without your practical course I feel this would have been impossible. My business continues to grow." —Philip G. Brogan, Louisville, Ky.

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"I am Broadcast Engineer at WLPM. Another technician and I have opened a Radio-TV service shop in our spare time. Big TV sales here. As a result we have more work than we can handle." —J. H. Bangley, Jr., Suffolk, Va.

Praises NRI as Best Course

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"My first job was operator with KDLR, obtained for me by your Graduate Service Dept. I am now Chief Engineer in charge of Radio Equipment for Police and Fire Department."—T. S. Norton, Hamilton, Ohio.

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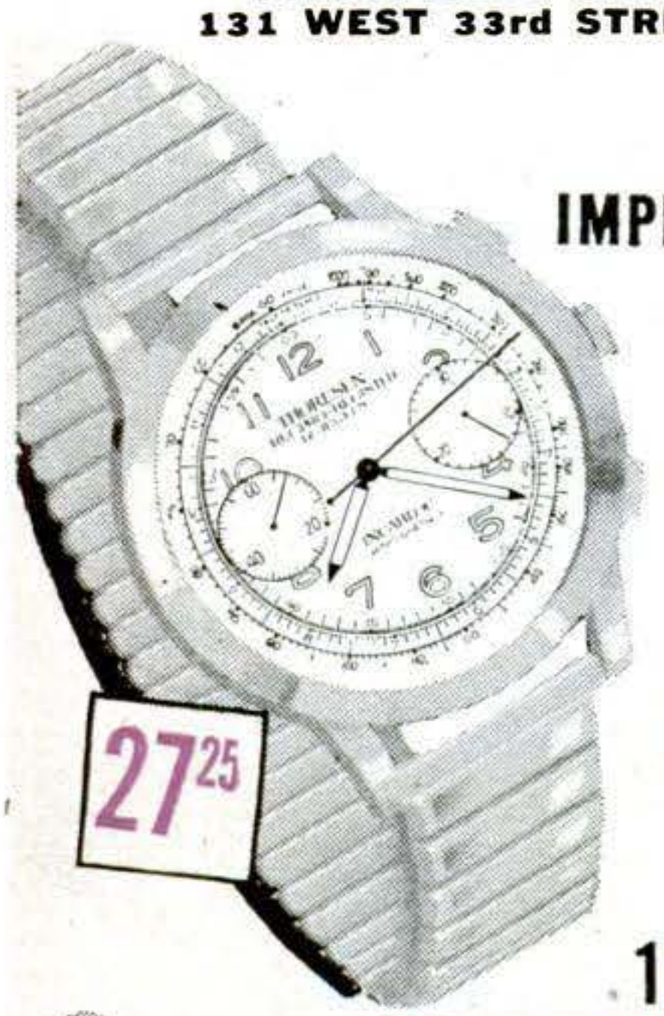

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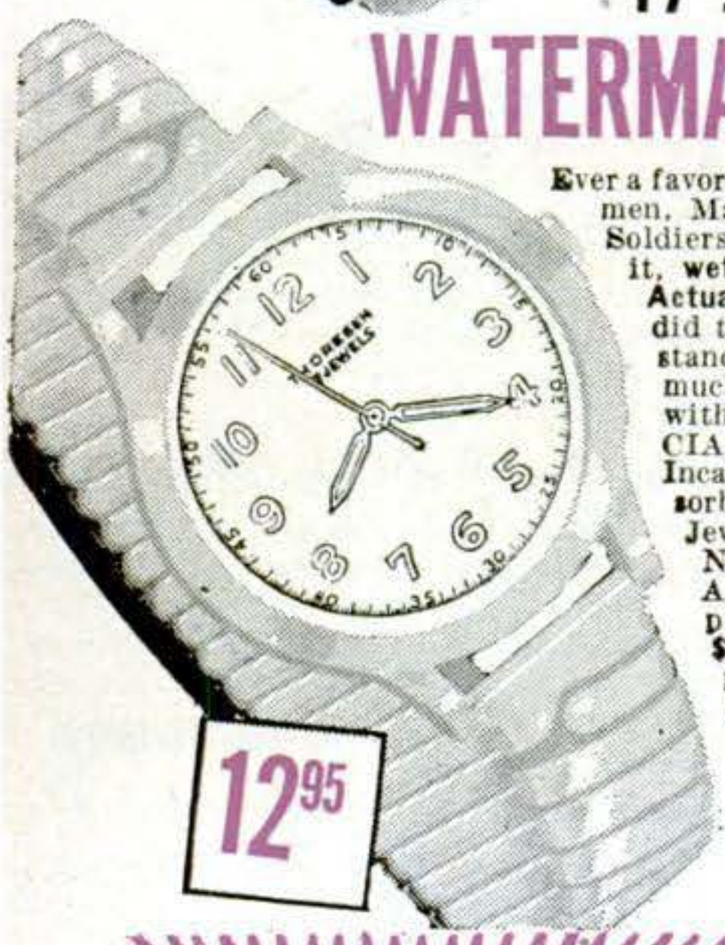

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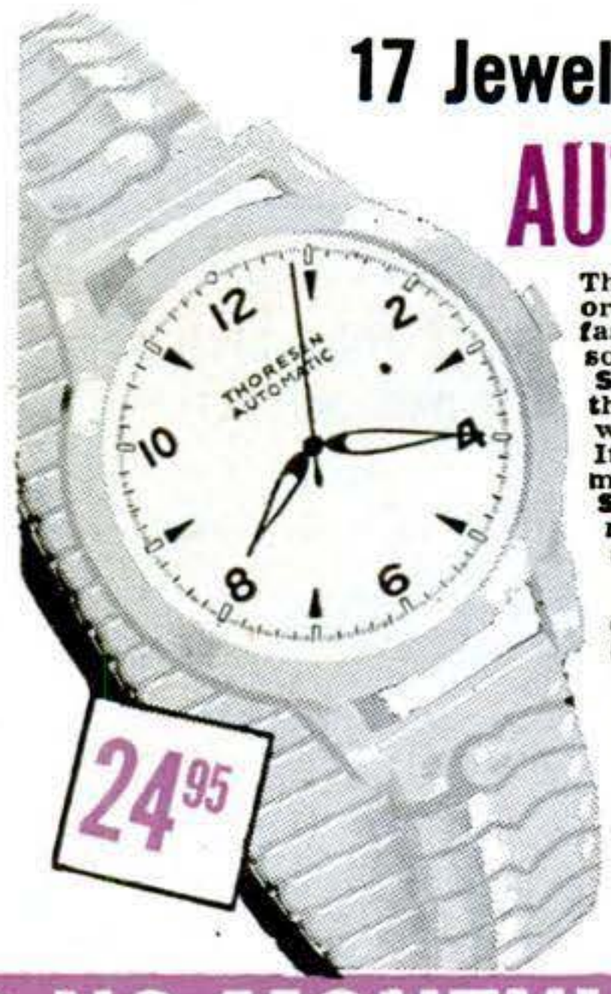
Ever a favorite with sportsmen, Marines, Sailors, Soldiers, Aviators. **Drop** it, **wet** it, **jolt** it at work or play! **Actually runs under water!** Splendid timepiece made with exacting standards. Thousands sold for much higher prices! Compare with waterproofs at **$59.50.** SPECIAL **QUALITY FEATURES:** Incabloc Protected • Shock Absorbing • Water Gasket • 17 Jewels • Luminous hands and No.'s • Unbreakable crystal. A guaranteed **QUALITY** timepiece. Best of all you save **$46.55.** Sacrifice price: **$12.95** plus 10% tax, total only: **$14.25.** Order by No. **224.**



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MAIL COUPON NOW—Don't delay. Be the first in your neighborhood to have this valuable set. But you must hurry if you want to get the 25 Hitler stamps practically as a *gift* . . . and the magnifying glass *free*. This special bargain offer may have to be withdrawn soon. So rush the coupon at once to *Littleton Stamp Co., Dept. 3-PS, Littleton, New Hampshire.*

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I enclose 25c. Please send set of 25 Hitler Stamps —all different. Also send FREE—while supply lasts —the stamp magnifying glass described above.

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Letters—

More Ways to Make a Cabin Howl

In answer to Hugh F. Kirkwood's plea for help in making the wind shriek around his cabin [Letters, Oct. '52, p. 20] I suggest he buy an Aeolian harp. An apple box and a few guitar strings might also work.

RICHARD H. HOPKINS, Beaumont, Tex.

A taut horsehair and the thin crack of a barely opened window might do the trick . . .

GAROLD W. CURO, S. San Francisco.

Hot-Rod Lingo Goes High-Brow

I plan to include the "Hot-Rod Dictionary" [Dec. '52, p. 185] in my bibliographical notes for *American Speech Quarterly*, which has subscribers throughout the world. I shall also take your magazine to class and draw the attention of my students to the many fine articles in it.

MAMIE MEREDITH, English Department
University of Nebraska, Lincoln, Neb.

Unnecessary Reminder

Are you kidding, or did you really pay some guy $5.00 for the idea in the November issue [p. 144] of putting a light on the car door to remind the driver to turn off his radio or heater?

As far back as I can remember, an awful lot of cars have been wired so that when the switch key is removed—bingo—all accessories are automatically shut off.

LEO REILLY, Kansas City, Mo.

Yes, but this holds true only for accessories wired into the ignition circuit. Parking, fog and back-up lights and some radios, heaters and other accessories not installed by the manufacturer may not be connected this way.

Flashlight Cells Won't Corrode

Your article on home flashlight repairs [Dec. '52, p. 226] was excellent and interesting. One thing struck me as old-fashioned, though. The danger of having cells stick or corrode in flashlight cases has been virtually eliminated by the sealed-in-steel Ray-O-Vac leakproof cell.

ART SWENSON,
Ray-O-Vac Co., Madison, Wis.

Jim Williams Not His Man

Being a Jim Williams fan, I was much interested in the article about him in the September issue [p. 90]. I have been told that before he started cartooning he worked on a ranch near Sterling City, Tex., and there gathered much of his cowboy lore. Is

this true? I also have heard that for a while he worked in the Texas & Pacific Railway's machine shops in Big Spring, Tex. Please set me right on this so I can continue or cease to brag on his Texas background.

W. L. EDMOND, Waco, Tex.

Jim says he's not the man you ask about; that he never worked in Texas. But he also says that he had such a riotous youth and worked in so many other places that people are constantly asking him questions like yours.

Model T Clearing House

When your August issue came out with that article about buying an antique car [p. 115], I had been planning for some time to buy and fix up a Model T. Once I got started, I had trouble getting stopped.

Antiques are just starting to blossom in this territory. Several prospective collectors started to talk to me about buying cars and parts for them. Before we knew what was

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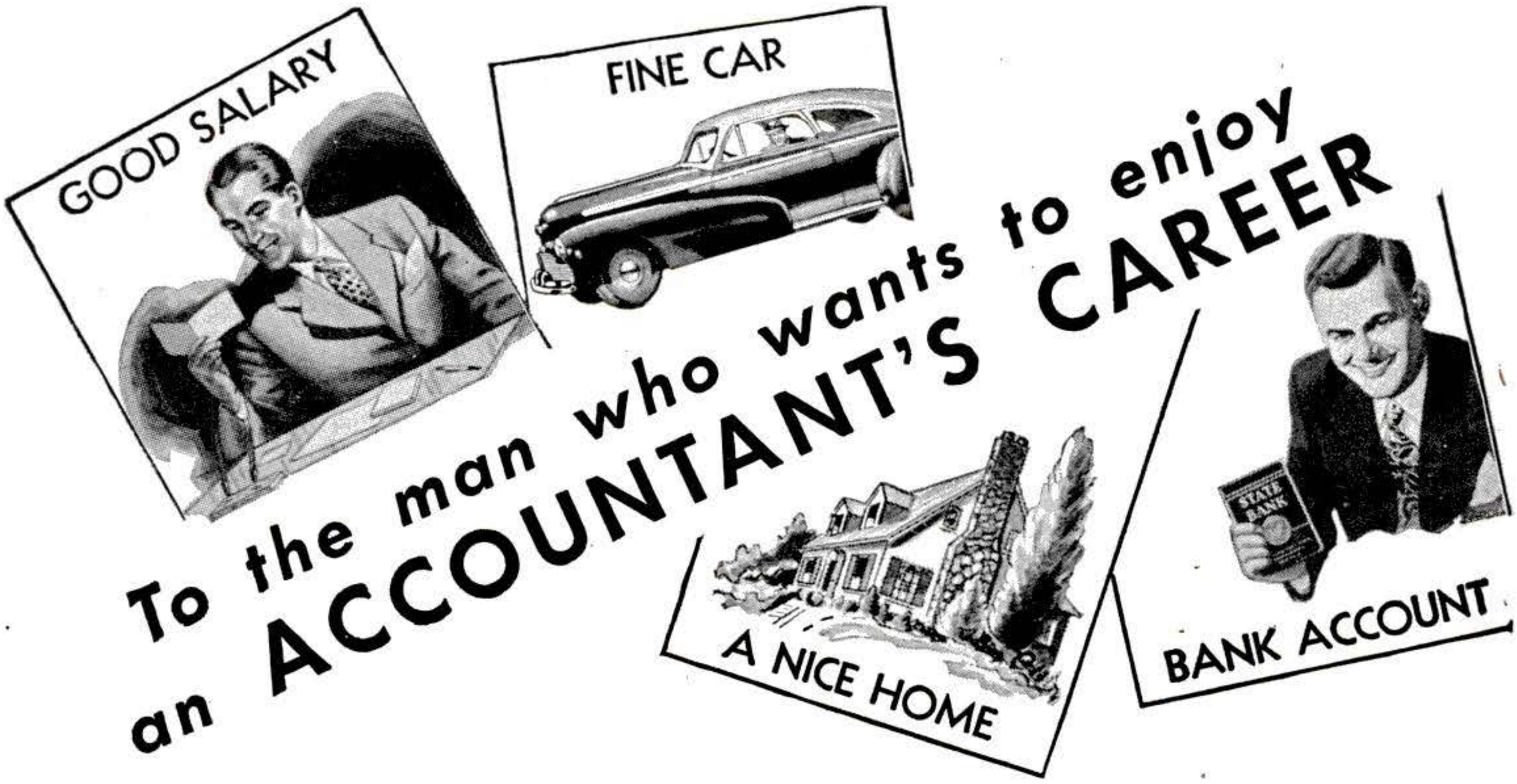

IF you're that man, here's something that will interest you.

Not a magic formula—not a get-rich-quick scheme—but something more substantial, more practical.

Of course, you need something more than just the desire to be an accountant. You've got to pay the price—be willing to study earnestly, thoroughly.

Still, wouldn't it be worth your while to sacrifice some of your leisure in favor of interesting home study—over a comparatively brief period? Always provided that the rewards were good—a salary of $4,000 to $10,000?

An accountant's duties are interesting, varied and of real worth to his employers. He has *standing!*

Do you feel that such things aren't for you? Well, don't be too sure. Very possibly they *can* be!

Why not, like so many before you, investigate LaSalle's modern Problem Method of training for an accountancy position?

Just suppose you were permitted to work in a large accounting house under the personal supervision of an expert accountant. Suppose, with his aid, you studied accounting principles and solved problems day by day—easy ones at first—then more difficult ones. If you could do this—and could turn to him for advice as the problems became complex — soon you'd master them all.

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You cover accountancy from the basic Principles right up through Accountancy Systems and Income Tax Procedure. Then you add C. P. A. Training and prepare for the C. P. A. examinations.

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Your progress is as speedy as you care to make it—depending on your own eagerness to learn and the time you spend in study.

Will recognition come? The only answer, as you know, is that success *does* come to the man who is really *trained*. It's possible your employers will notice your improvement in a very few weeks or months. Indeed, many LaSalle graduates have paid for their training—with increased earnings—before they have completed it! For accountants, who are trained in organization and management, are the executives of the future.

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For your own good, don't put off investigation of *all* the facts. Write for our free 48-page book, "Accountancy, The Profession That Pays." It'll prove that accountancy offers brilliant futures to those who aren't afraid of serious home study. We'll also include "Ten Years' Promotion in One"—a book which has helped many men. Send us the coupon *now*.

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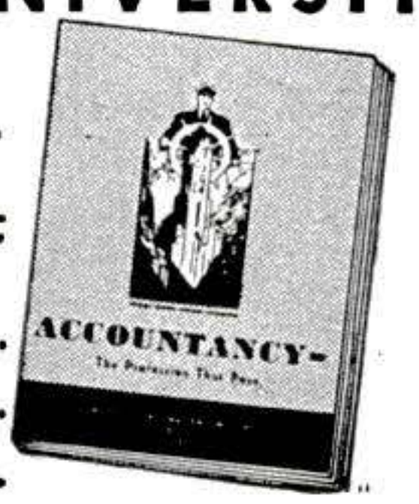

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going on, we were running a clearing house for buyers and sellers of cars and parts.

M. L. MECHAM, Huron, S. D.

See page 201 for another Model T story.

Old Cars Had Clearance

In your article "Buick Sets New Style for 1953" [Oct. '52, p. 100], you say: "The whole car has been lowered an inch and a half . . . Actually, there is no real point in having cars as high as they are."

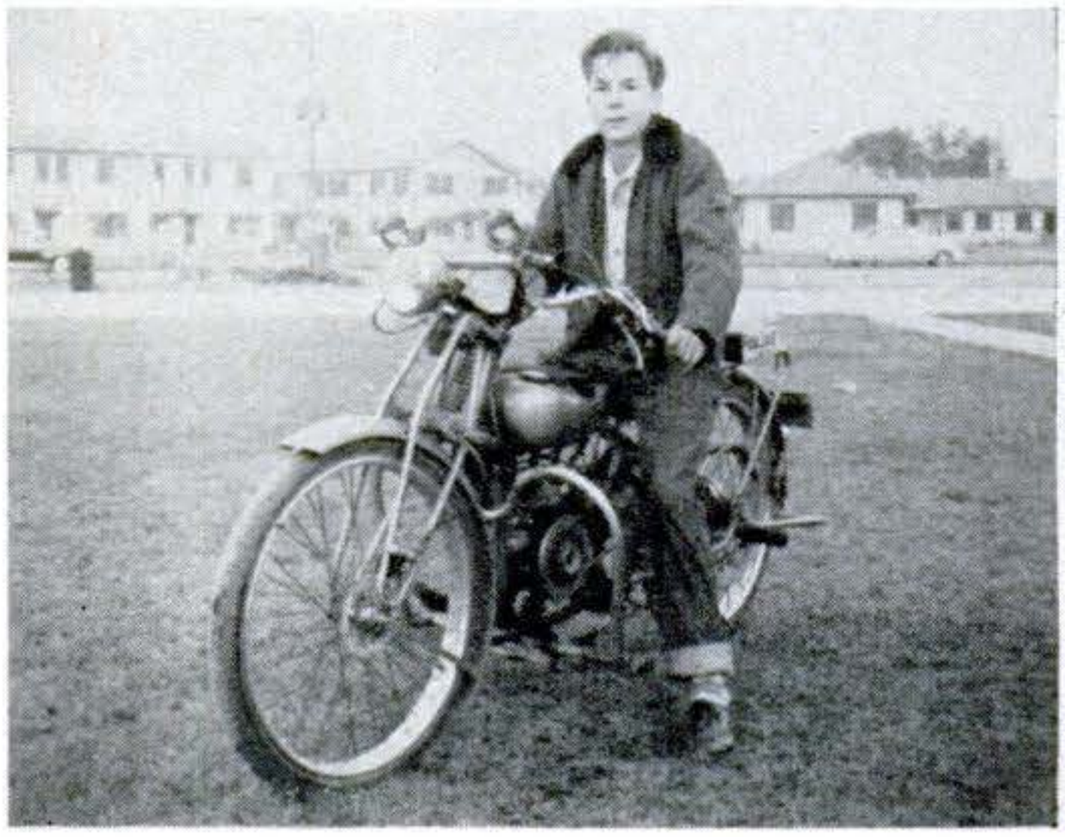
Now, do you really believe that? I realize that the Buick Skylark is primarily a road car, and a low-slung look adds raciness, but clearance need not be sacrificed to the extreme that it is.

The famous road cars of the past (Duesenberg, Packard, Stutz) had roadability, ride and cornering qualities that would leave the Buick Skylark in the nearest dump—and they had clearance.

JIM MCCANN, San Francisco.

Drove Japanese Cars

I nearly keeled over upon seeing the article about Japan's automobiles in November's PSM [p. 136]. I'm back in the good old U. S. now, but I spent the last five years in Japan, and during those years I tried out a few of their autos. Your de-



scription fits them perfectly. One auto you neglected to mention is the battery-powered Tama.

I am enclosing a photo of me [above] on a Japanese Tokatsu motorbike.

ROHM W. HOLLINGSWORTH, Mishawaka, Ind.

Vip's HAIR TYPES

SHAGGY DOG STORY—very funny, unless the joke is on *your* hair! For *all-day* grooming depend on new Fitch IDEAL Hair Tonic. Secret ingredient gives *naturally-neater* look—without greasy goo or cream. Helps scalp *feel* better while making thin hair *look thicker*—thick hair *stay* slicker! No lingering odor. New tonic action relieves dry, itchy scalp . . . and regular care with new Fitch IDEAL Hair Tonic helps keep hair free of loose, ugly dandruff!

Get New Fitch *Ideal* Hair Tonic

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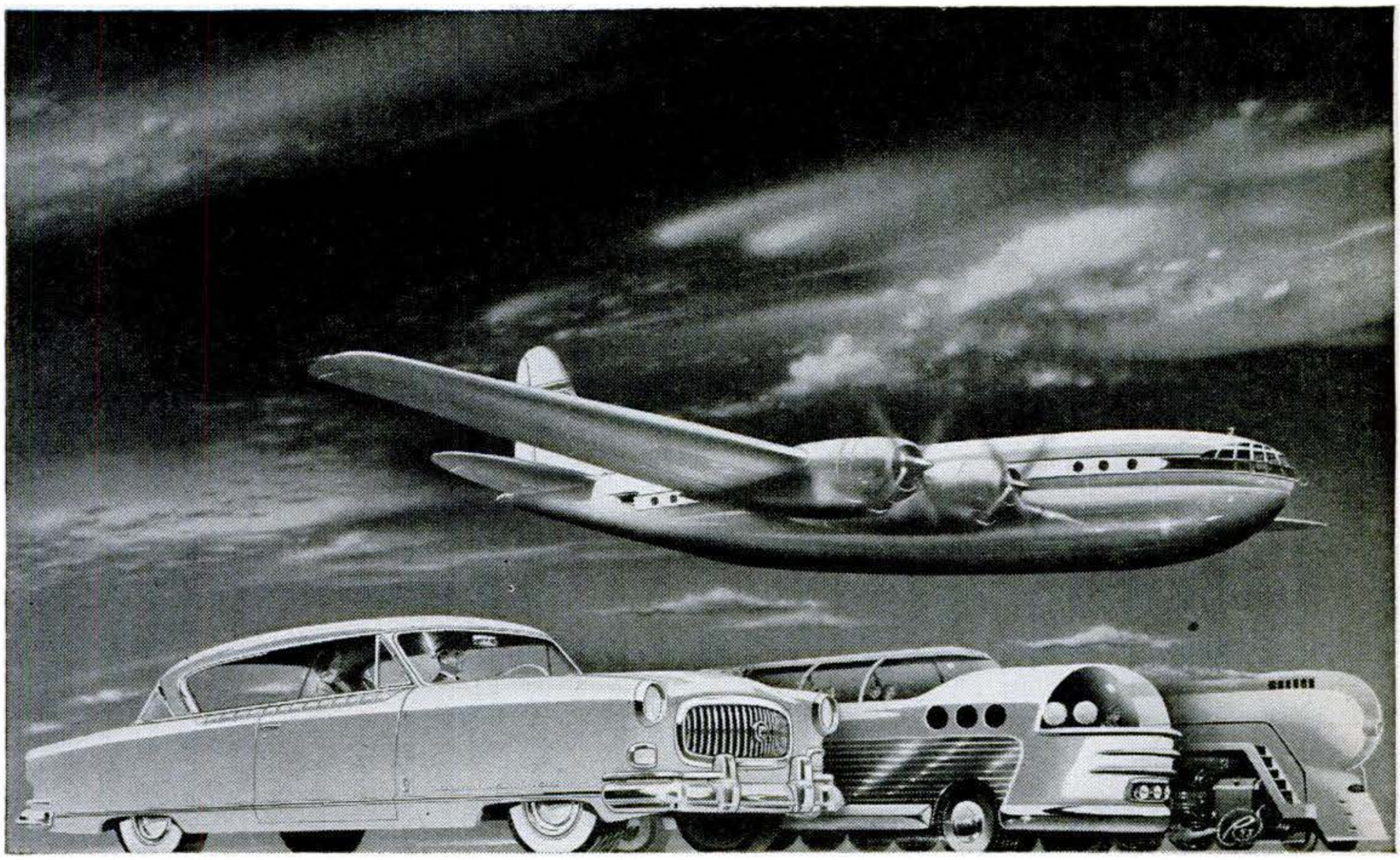

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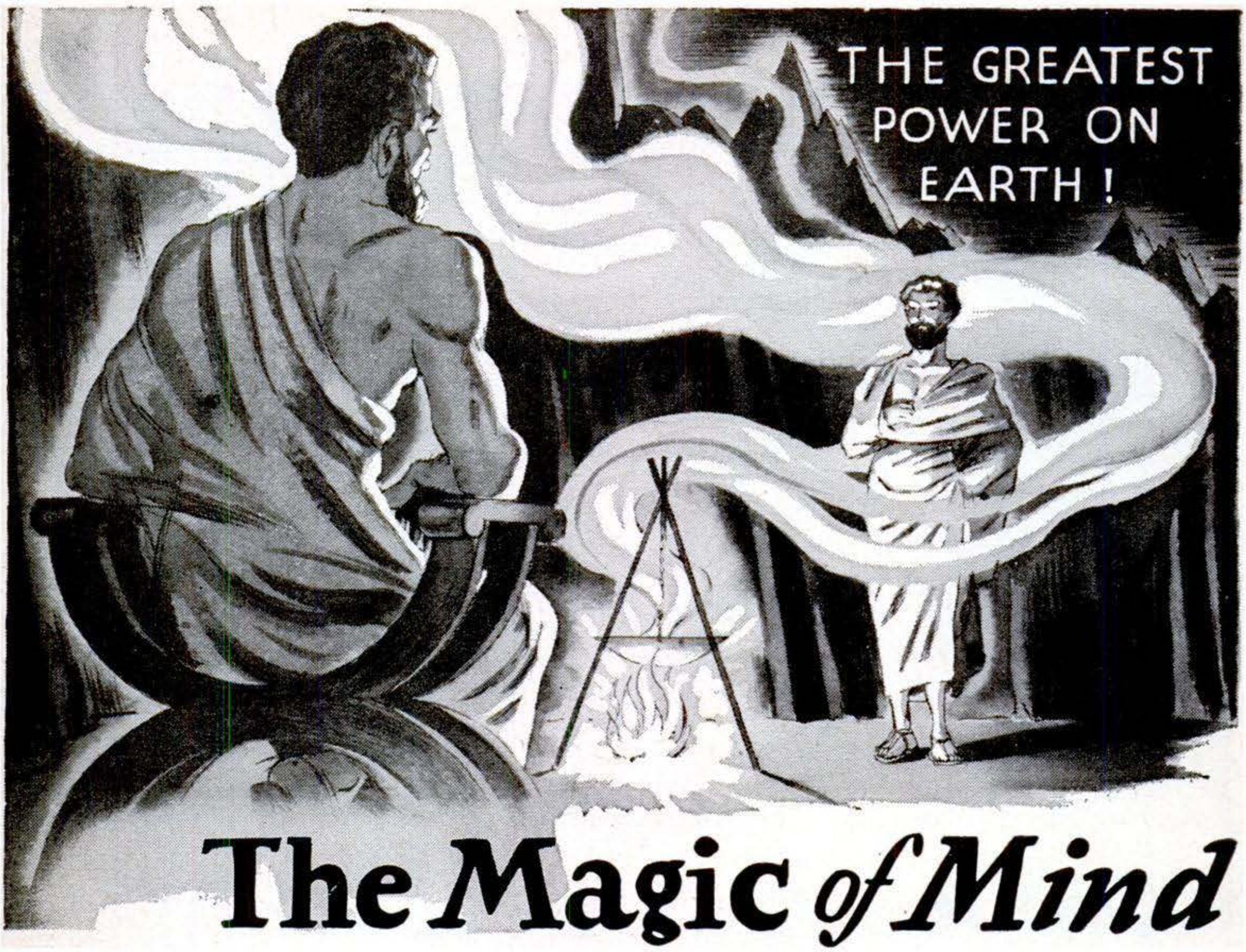

The Magic of Mind

WERE the great personages of the past victims of a stupendous hoax? Could such eminent men of the ancient world as Socrates, Pericles and Alexander the Great have been deluded and cast under the spell of witchcraft—or did the oracles whom they consulted actually possess *a mysterious faculty of foresight?* That *the human mind can truly exert an influence over things and conditions* was not a credulous belief of the ancients, but a known and demonstrable fact to them. That there exists a wealth of infinite knowledge just beyond the border of our daily thoughts, which can be aroused and commanded at will, was not a fantasy of these sages of antiquity, but a dependable aid to which they turned in time of need.

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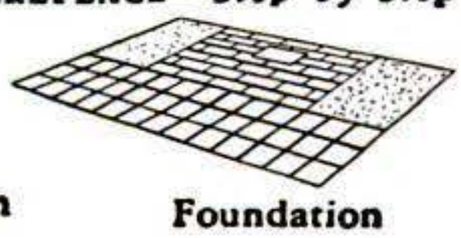

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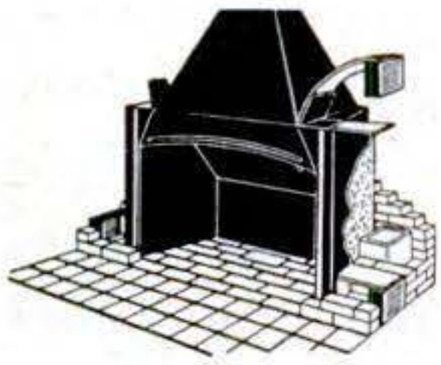

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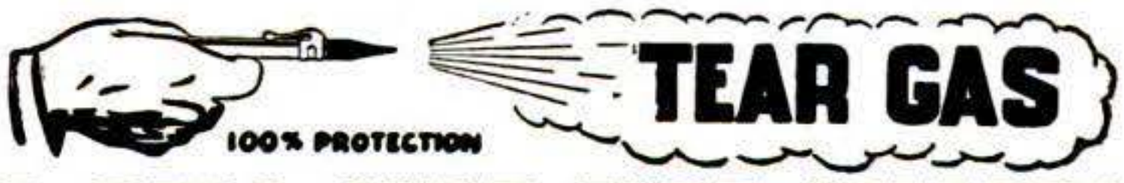

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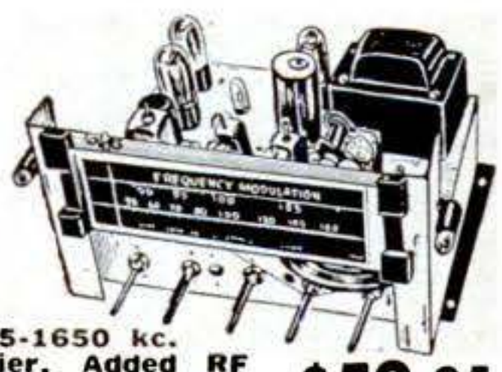

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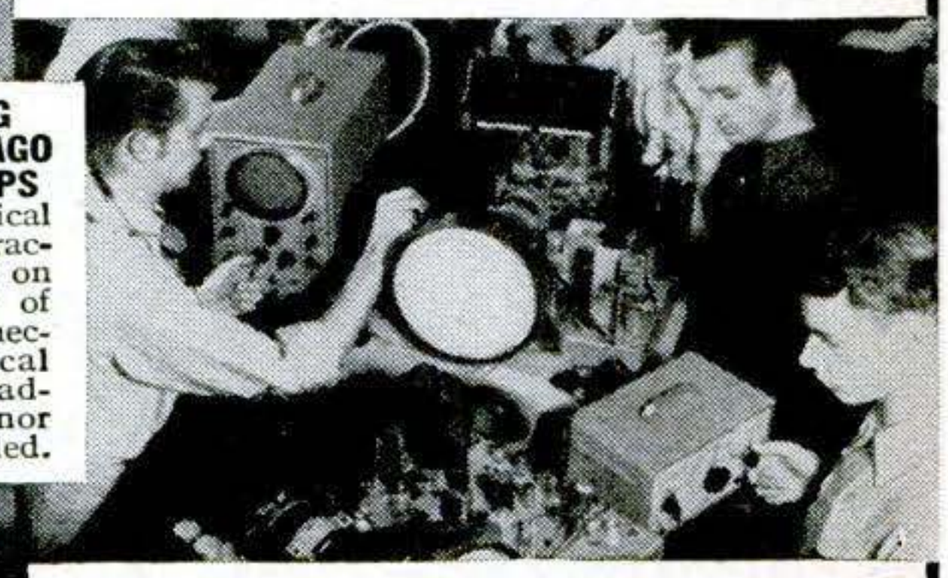

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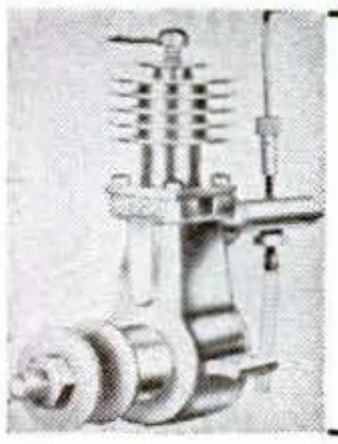

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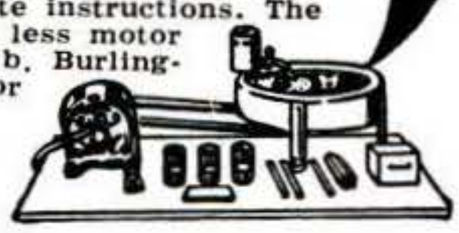

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2533 N. ASHLAND AVE., CHICAGO 14, ILL.

I would like your Opportunity News Bulletin showing "89 Ways to Earn Money in Television-Radio-Electronics"; also, complete facts about the training opportunity made possible by your organization.

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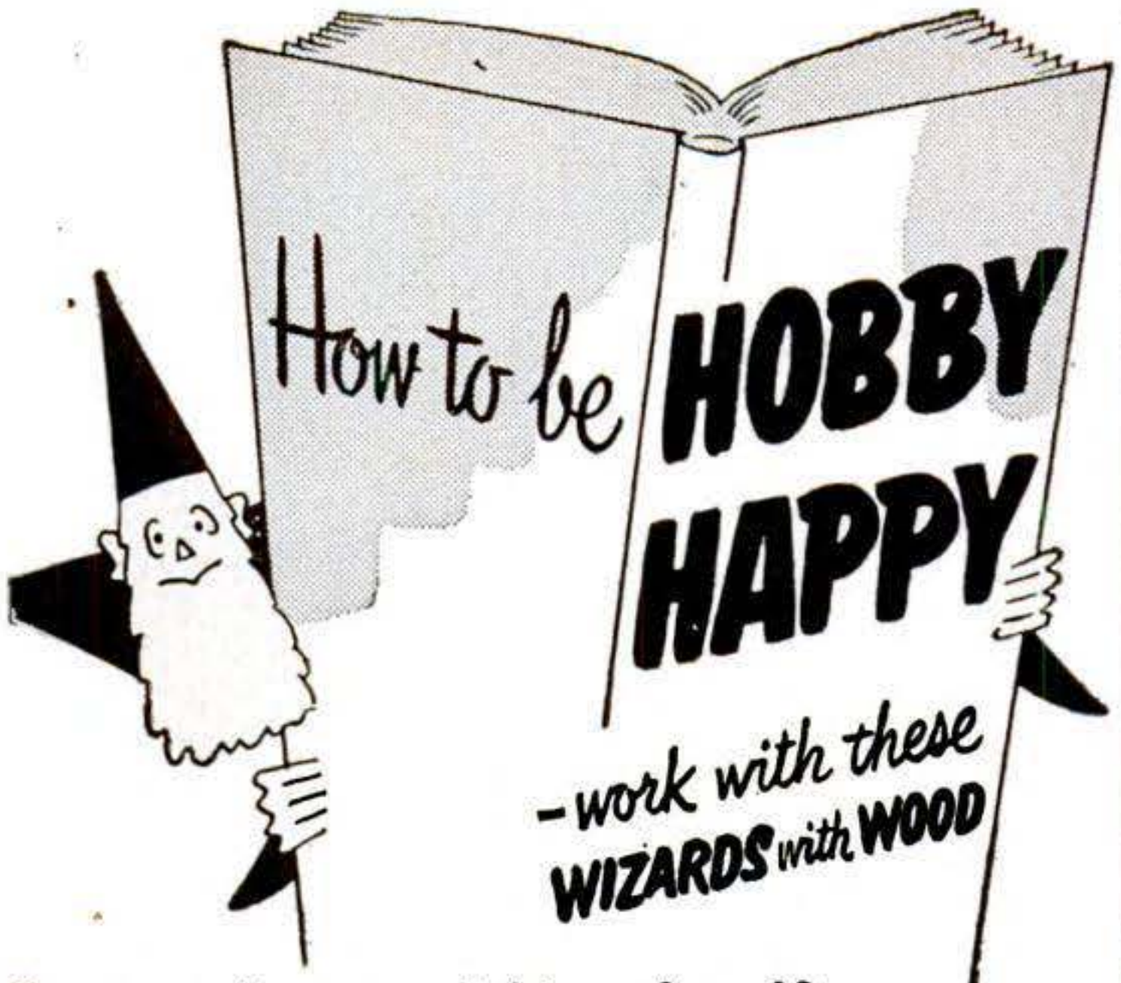

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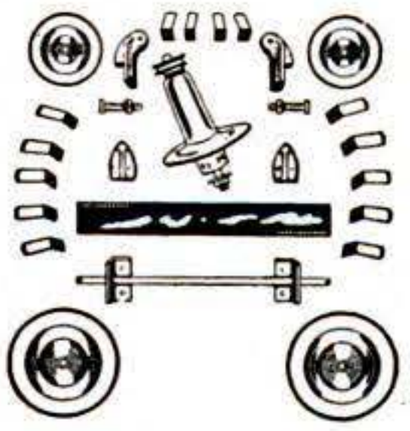

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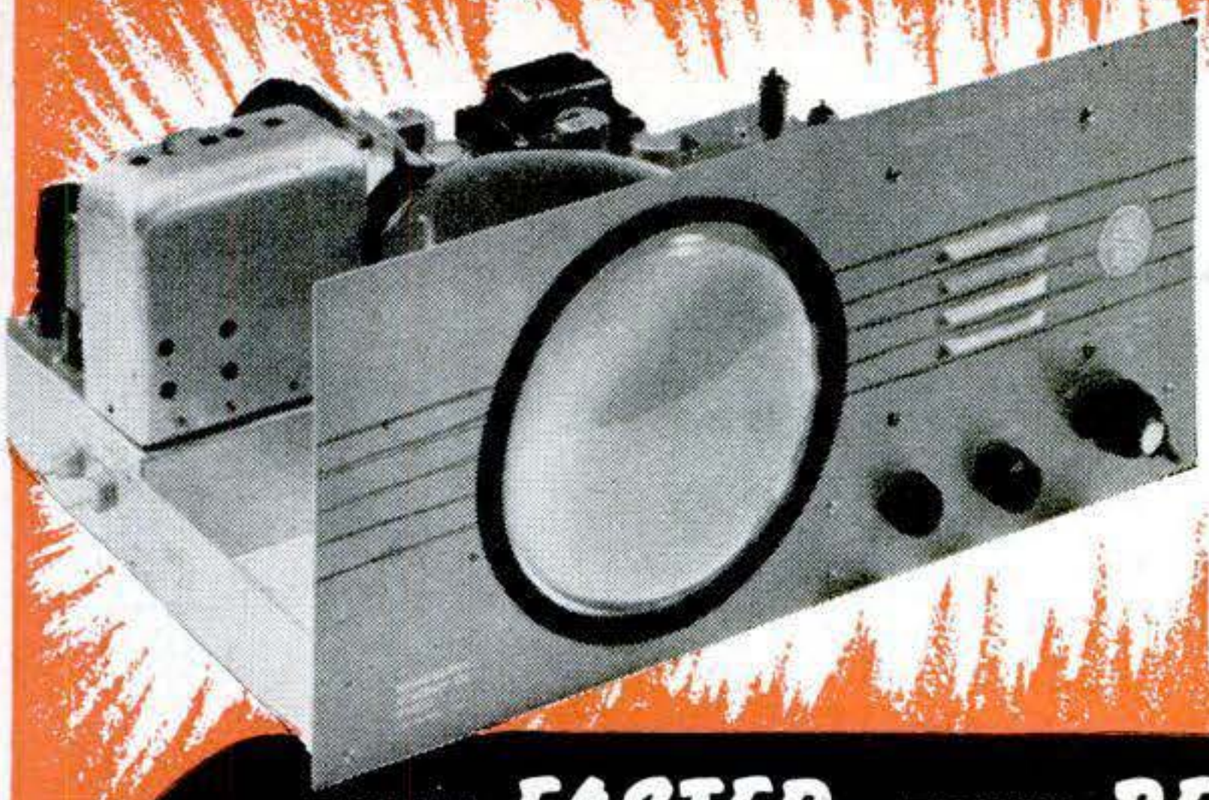

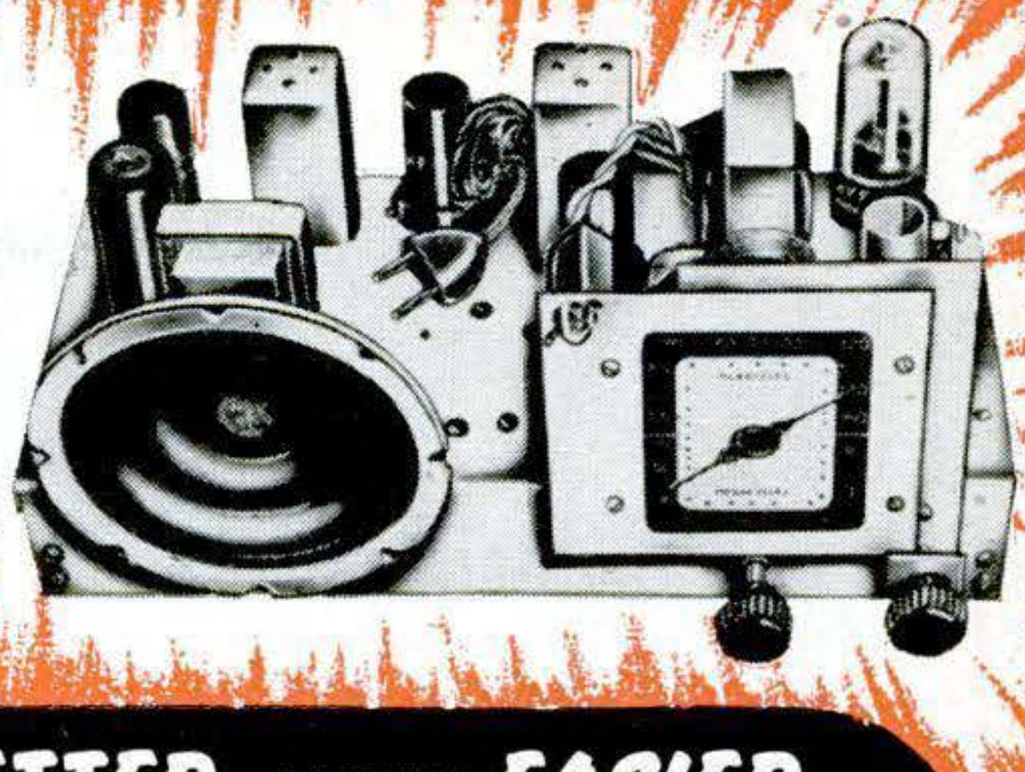

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You can get into Radio-Television, today's fastest growing big money opportunity field, in *months* instead of years! My completely new "package unit" training plan prepares you in as little as 10 months or even less! *No monthly payment contract to sign—thus NO RISK to you!* This is America's finest, most complete, practical training—gets you ready to handle any practical job in the booming Radio-Television industry. Start your own profitable Radio-Television shop . . . or accept a good paying job. I have trained hundreds of successful Radio-Television technicians during the past 21 years—and stand ready to train you, even if you have no previous experience! Mail coupon and get all the facts—FREE!

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A new easy way to plan the house of your dreams, save thousands of dollars and have fun doing it.

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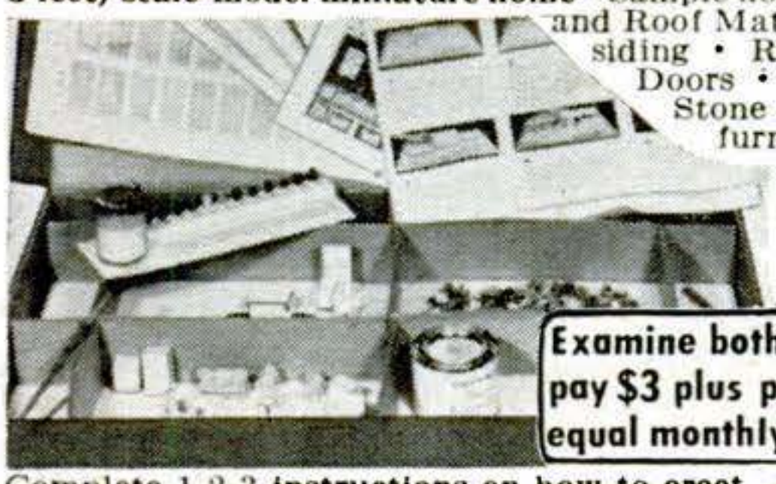
Then just put together the Hoyt Rust Scale Model Home Kit according to what you want your house to look like. You select the kind of doors, windows, stairs you want, because everything you need to put together a scale model home complete with miniature fireplace and die-cut furniture and fixtures, is included in the set.

EACH SET CONTAINS: A Hoyt Rust Model Home Kit including enough material to put together medium size (approximately 3 x 1 x 3 feet) scale-model miniature home • Sample floor plan • 10-ply Wall and Roof Material • Lithographed siding • Roofing • Flooring • Doors • Shutters • Brick • Stone • Built-ins • Die-cut furniture and fixtures • Patented steel clips and tool • 12 oil paints, thinner and brush. PATENT No. 2607972—



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"When I look at a man I often wonder whether he's one of these *experience-only* fellows—one who thinks his experience in his present job automatically qualifies him for the job ahead.

This Is What Men Tell Him

"Sometimes a man will tell me he's had five years' experience with us; based on that alone, he wants me to move him up. He doesn't realize that he may have mastered his present job in one year—and that his next four years simply repeated that *very same* round of experience. What I want to know is *what he has done for himself*—what he has added, on his own hook, to the things learned in his present job!"

How Do YOU Stack Up?

Looking at it that way, how do *you* really stack up? Have you done a lick of work, on the outside, to make yourself *worth* more money, to help *prepare* yourself for the job ahead?

Experience alone isn't the answer. You've seen that all around you. But if you were here working with us at I.C.S. you'd see personal reports by the hundreds telling what present experience *PLUS* new training can mean to a man. In fact, a recent Survey showed that—*in one single 120-day period* — 1973 I.C.S. students were promoted to better jobs!

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- ☐ Chemistry
- ☐ Analytical Chemistry
- ☐ Petroleum—Nat'l Gas
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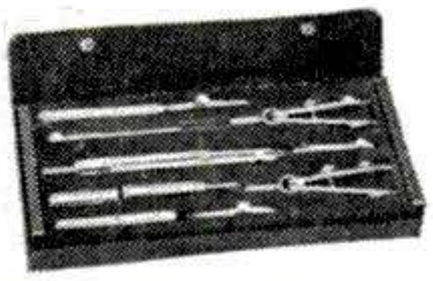

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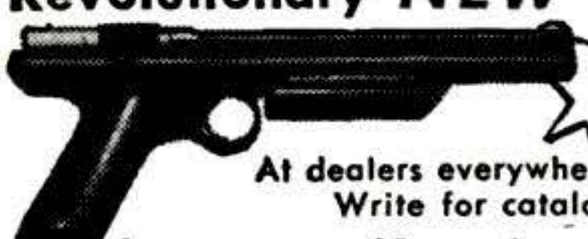

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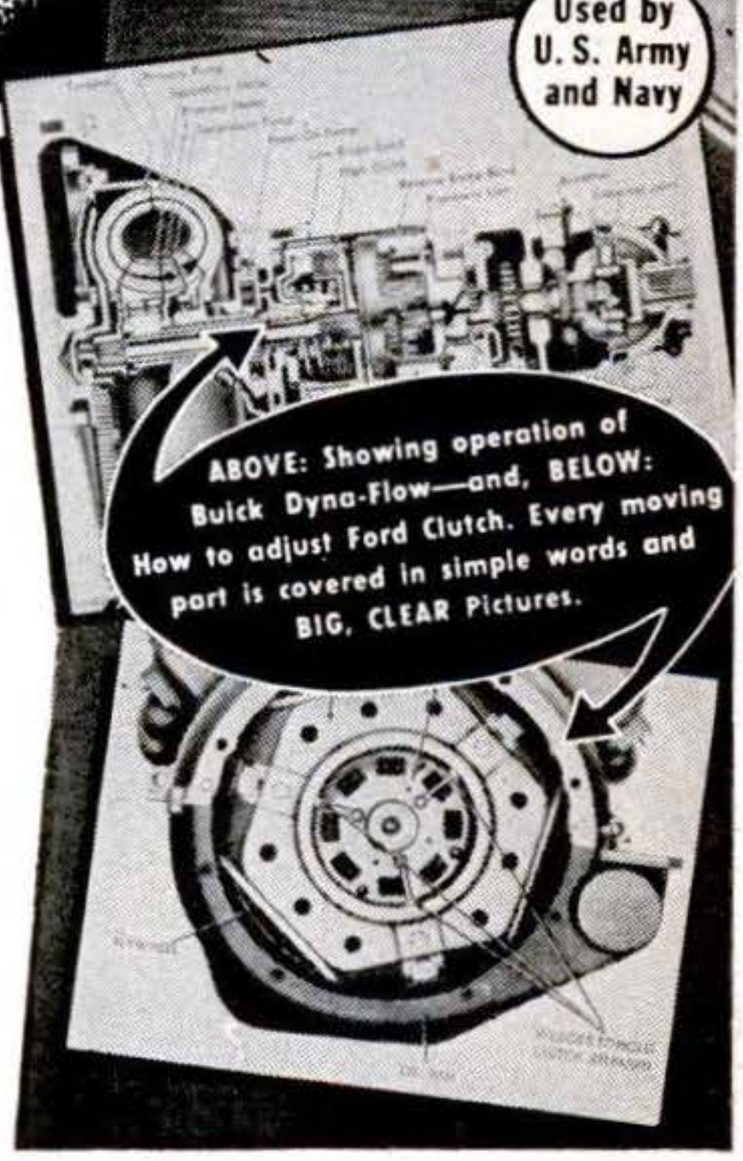

ABOVE: Showing operation of Buick Dyna-Flow—and, BELOW: How to adjust Ford Clutch. Every moving part is covered in simple words and BIG, CLEAR Pictures.

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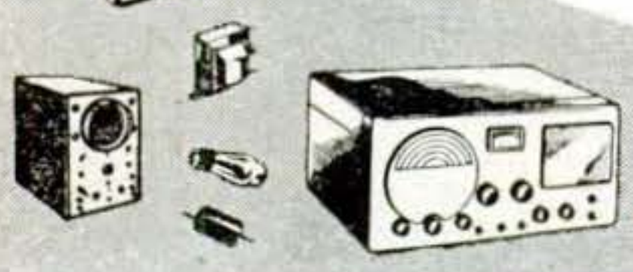

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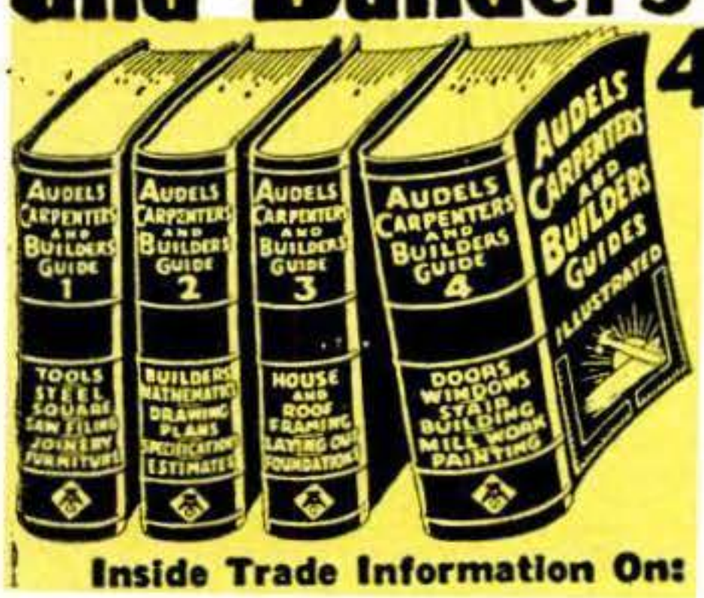

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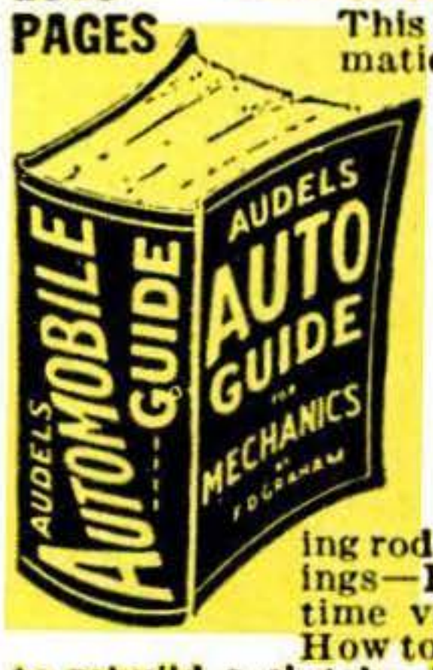

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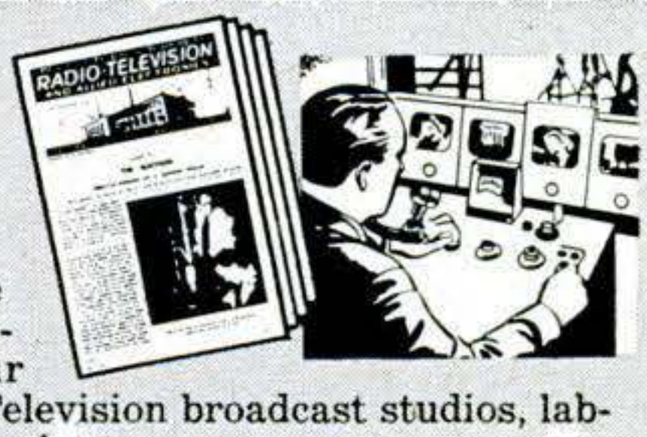

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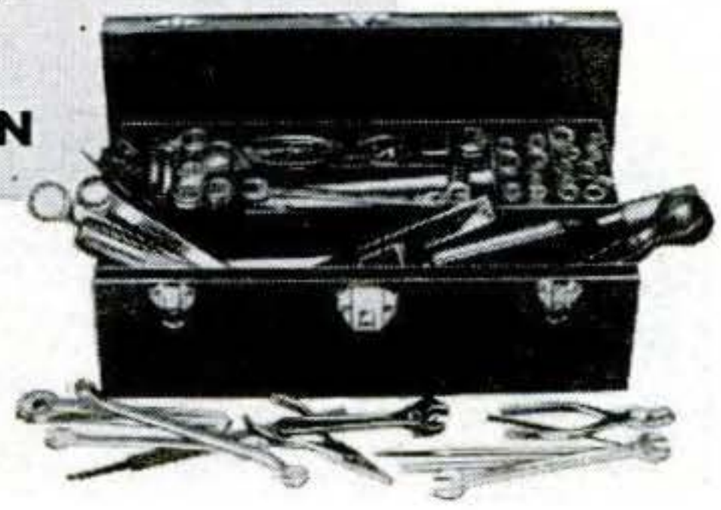

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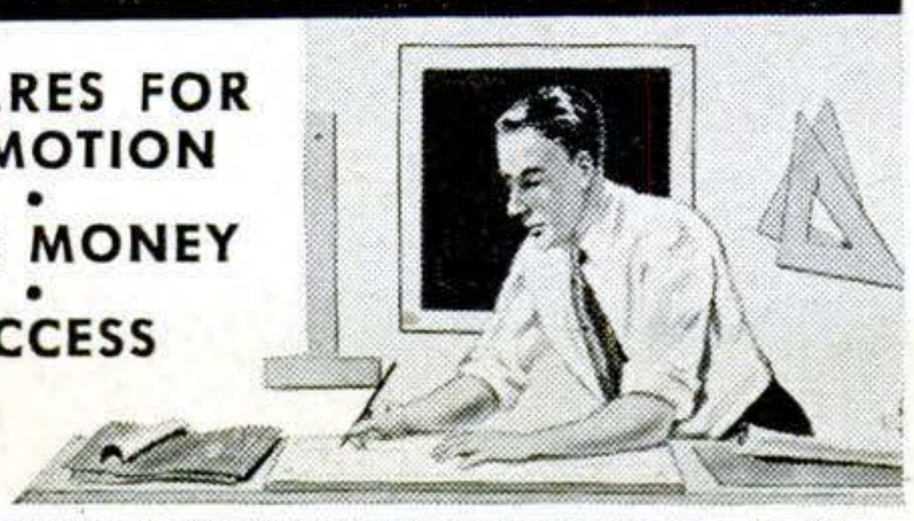

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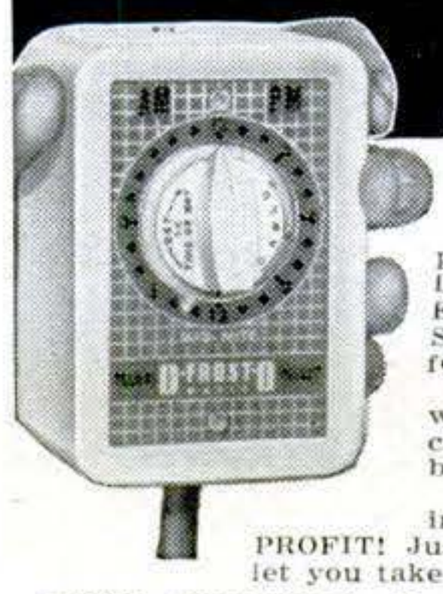

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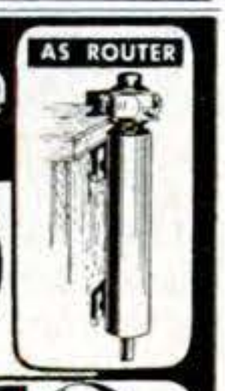

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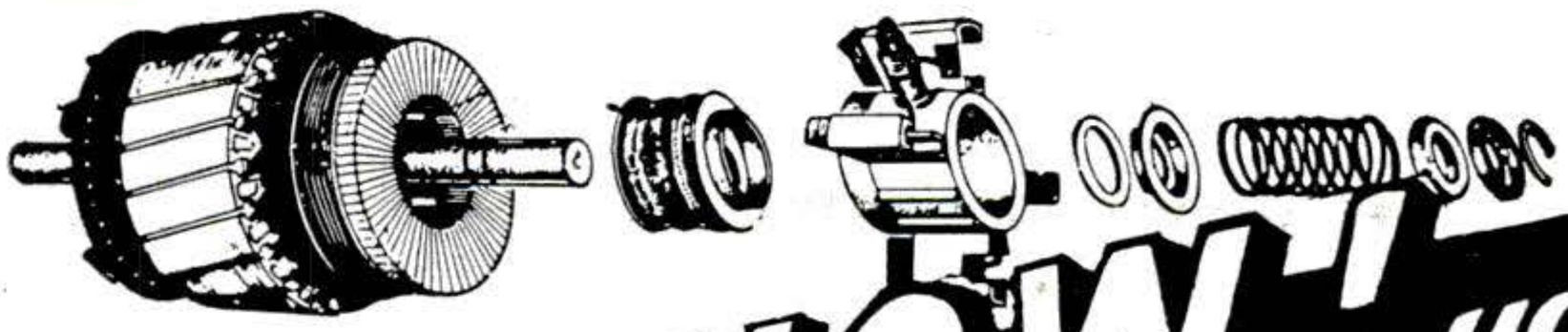

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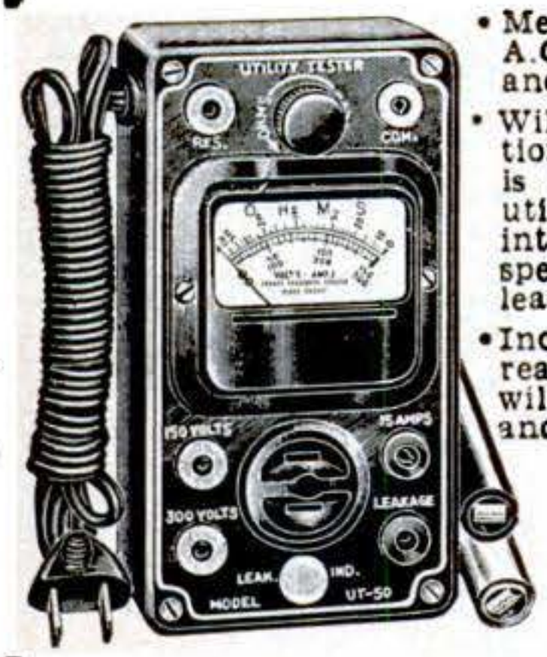

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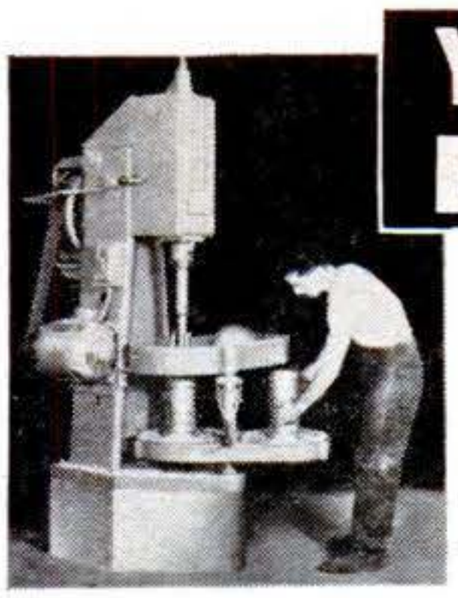

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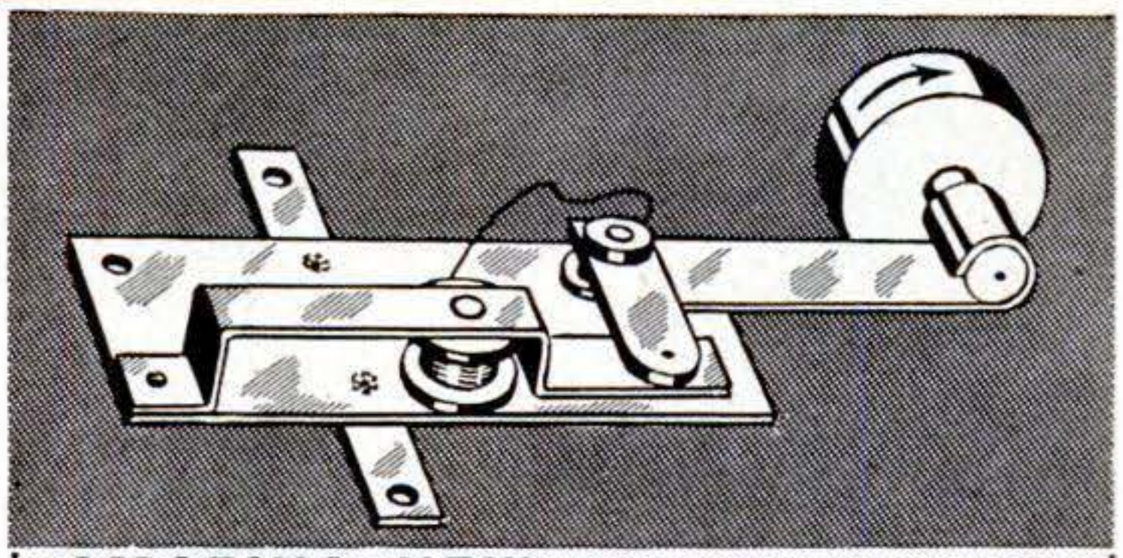

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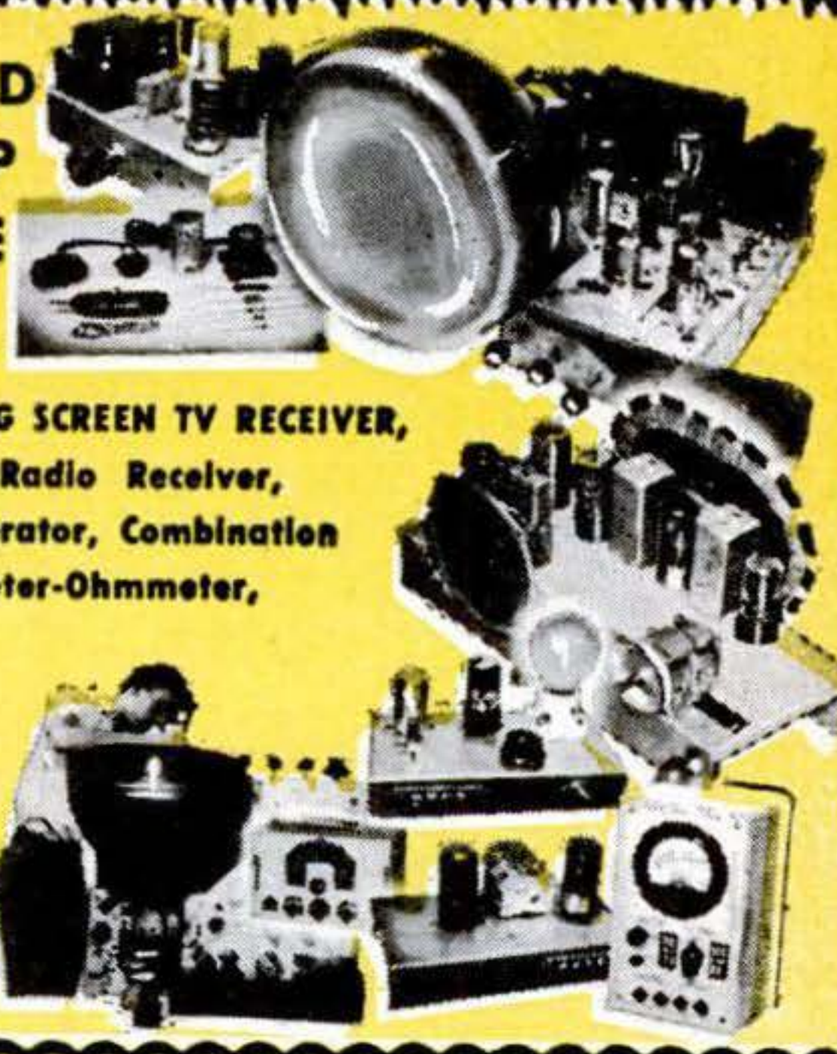

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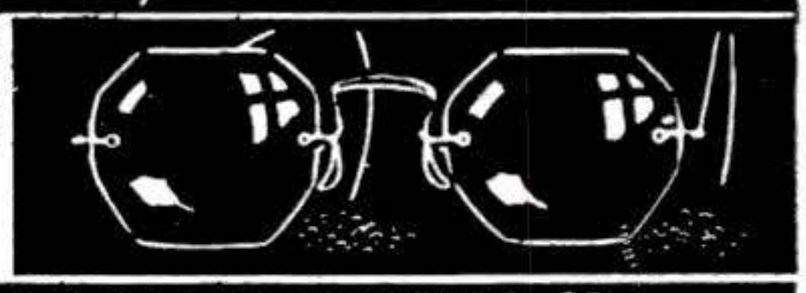

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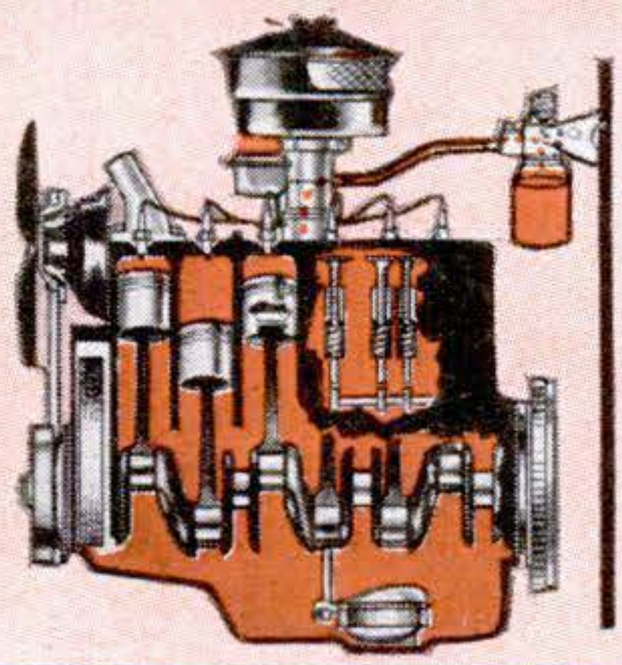

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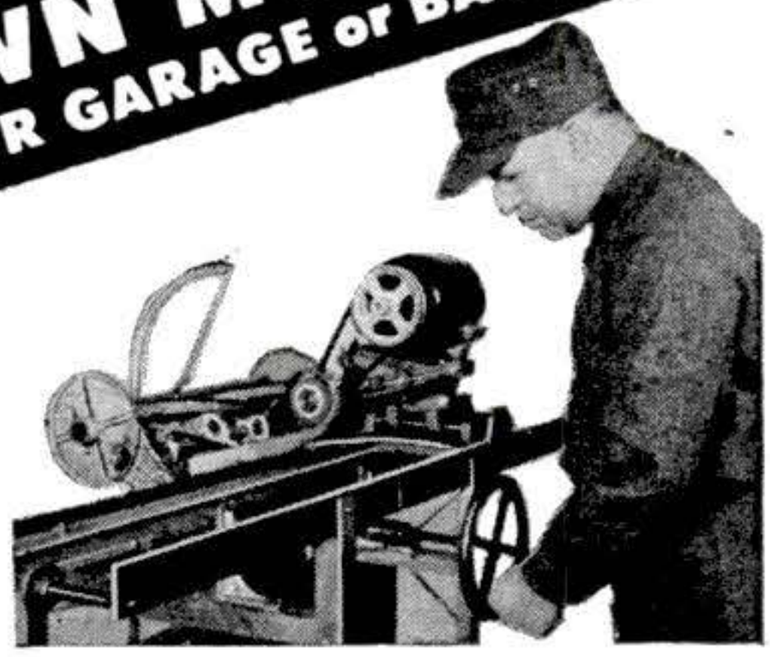

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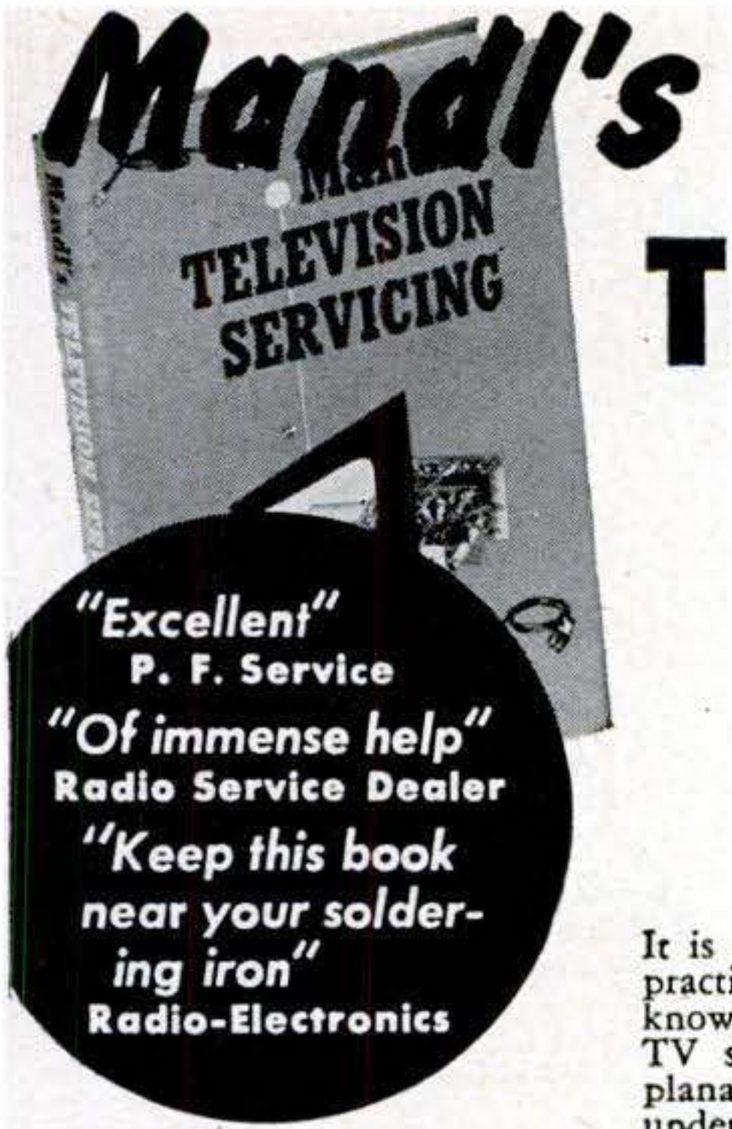

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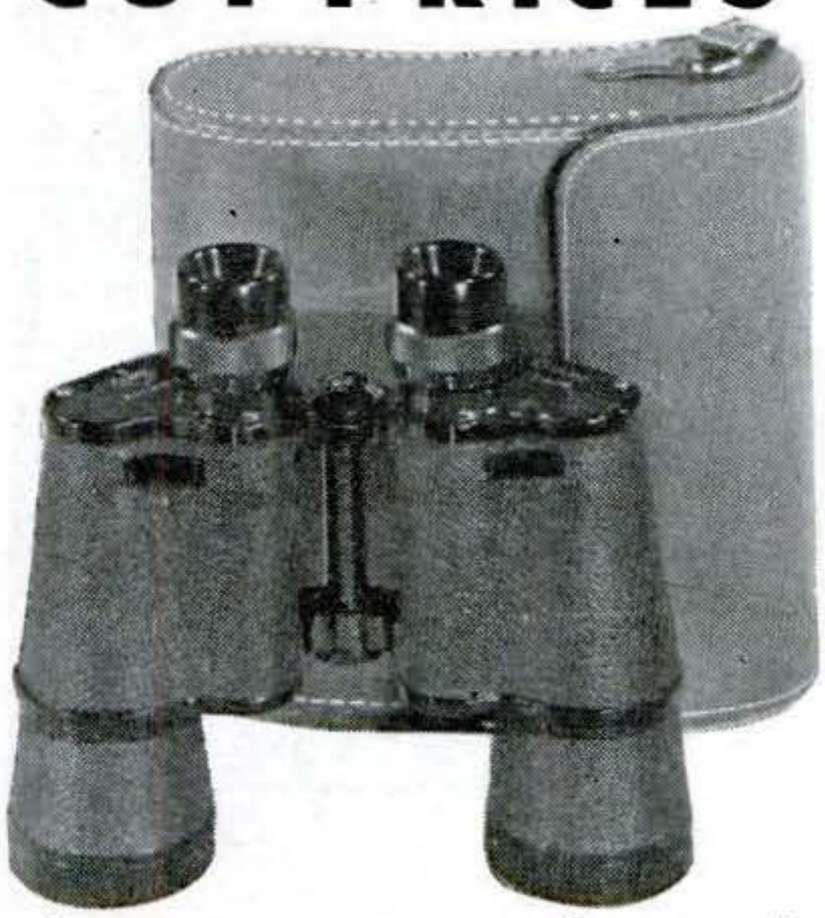

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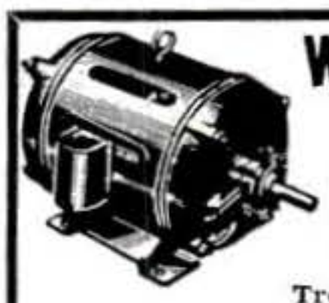

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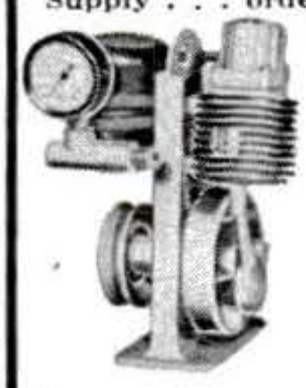

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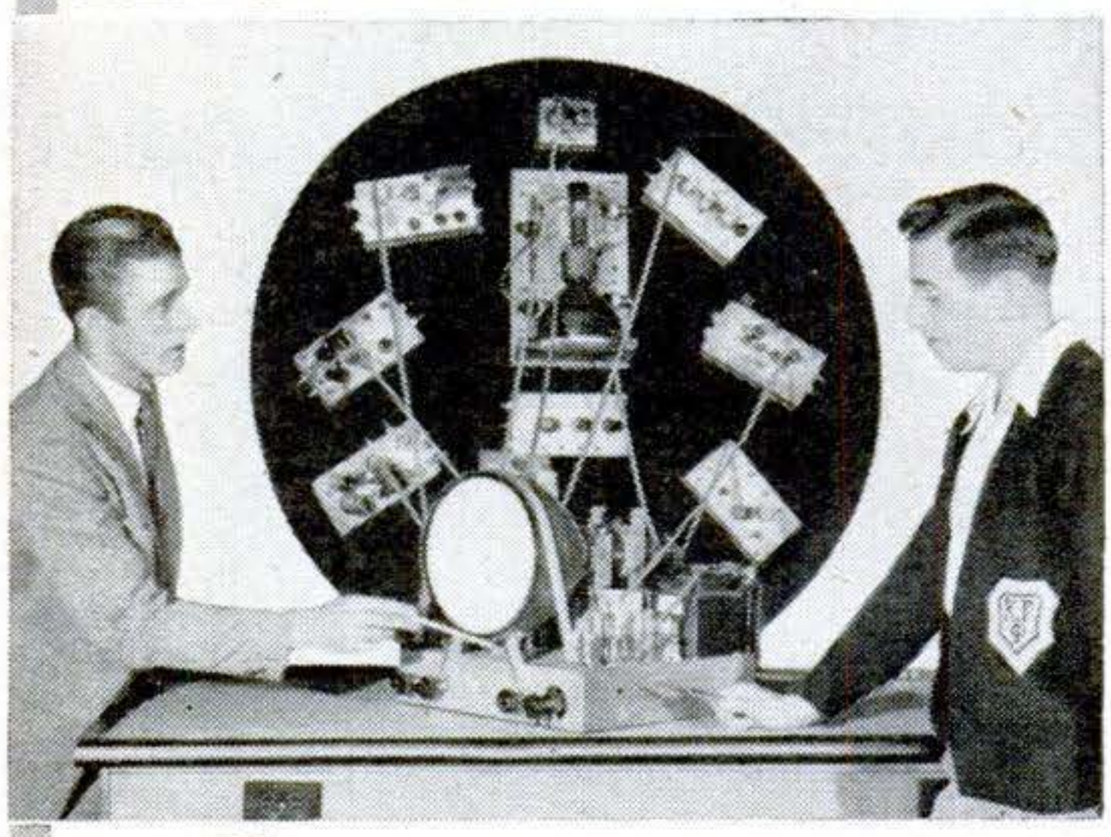

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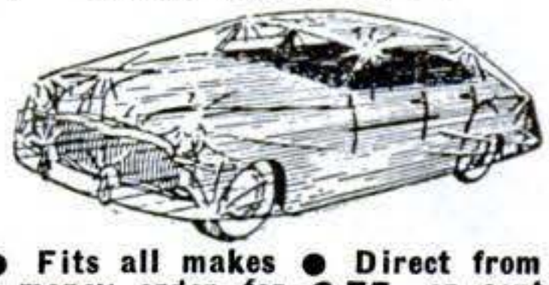

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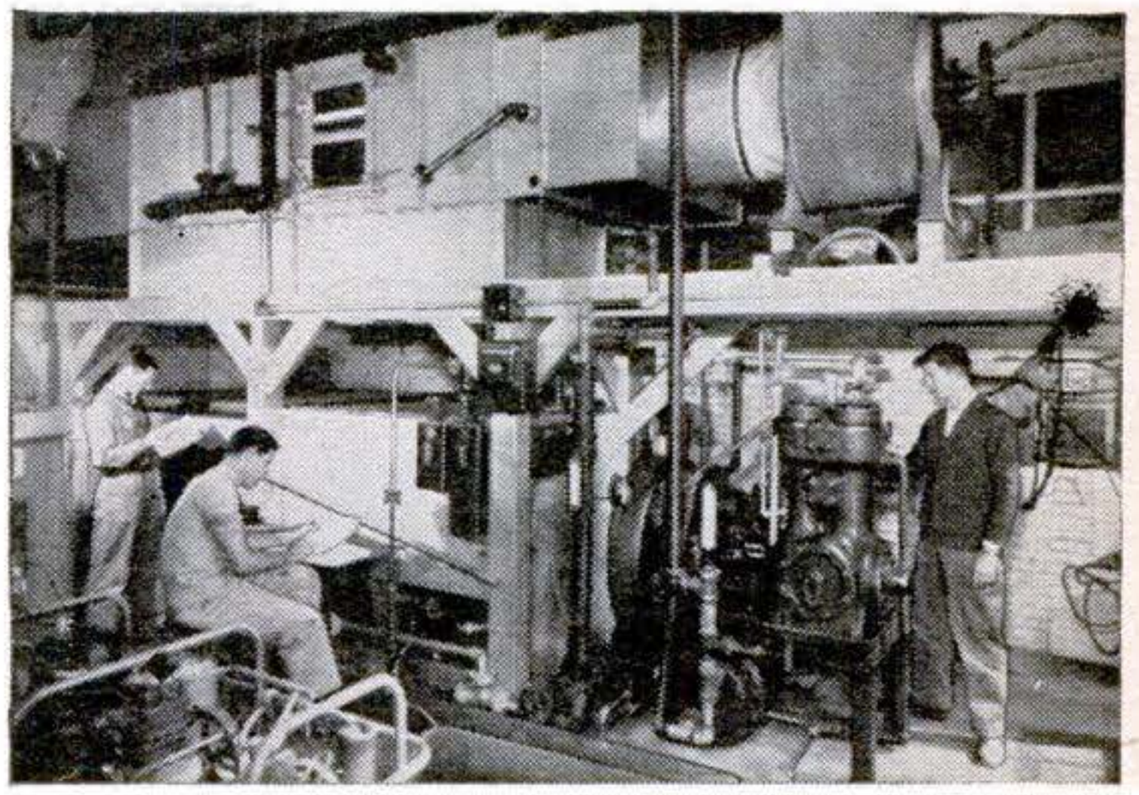

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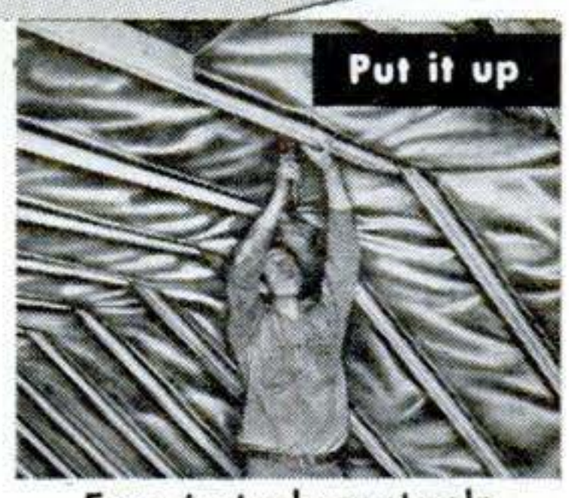

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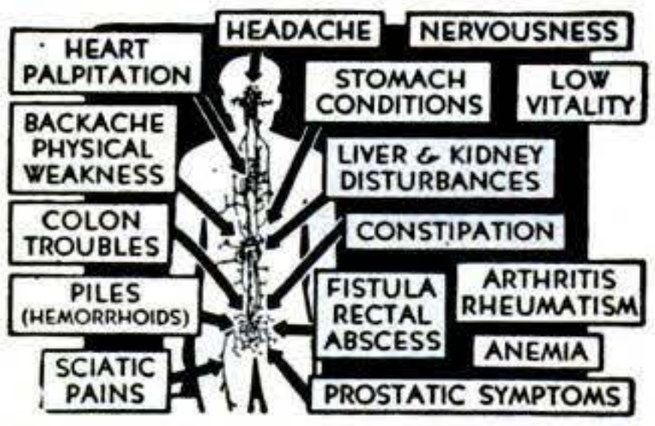

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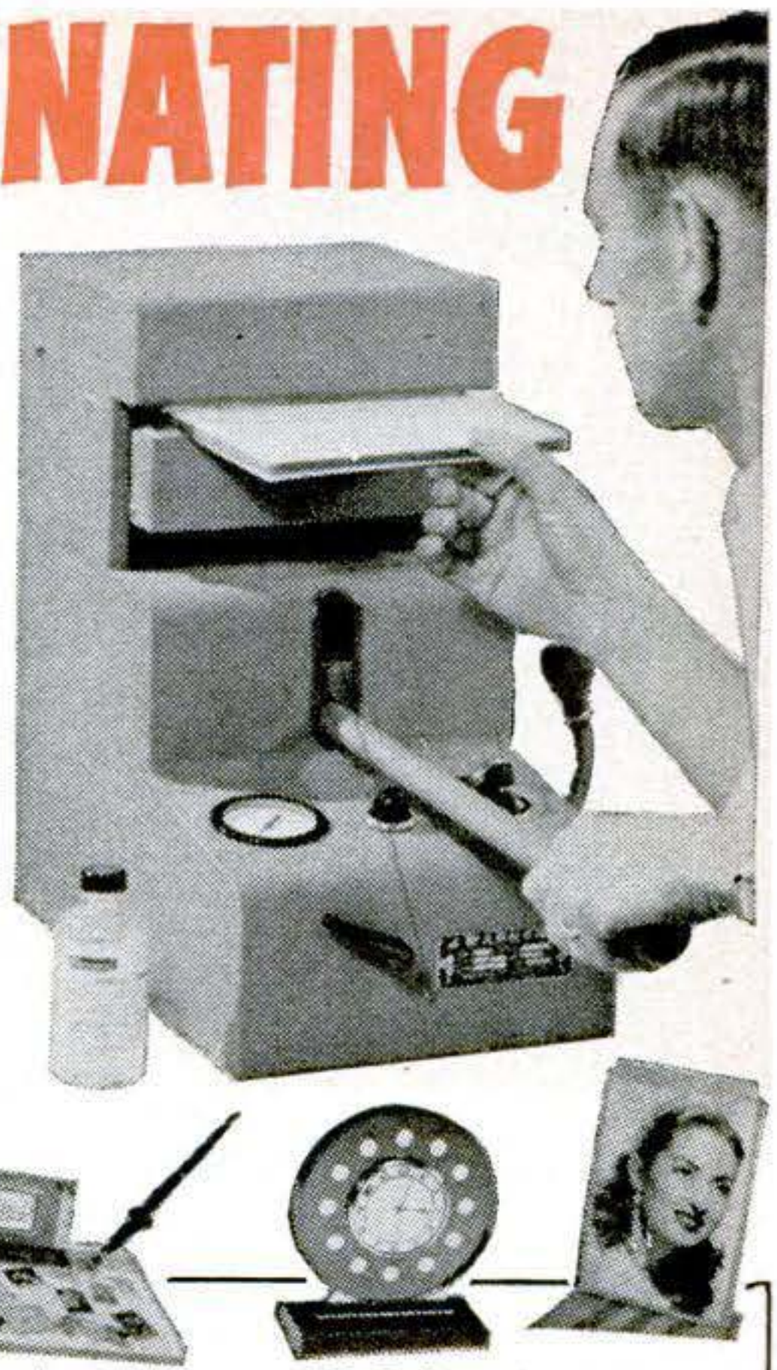

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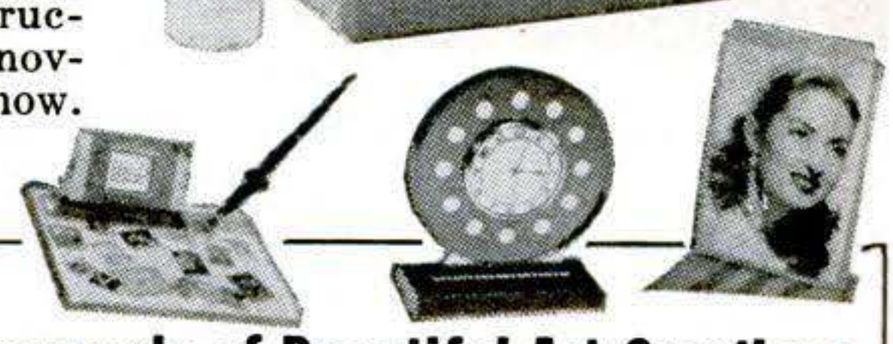

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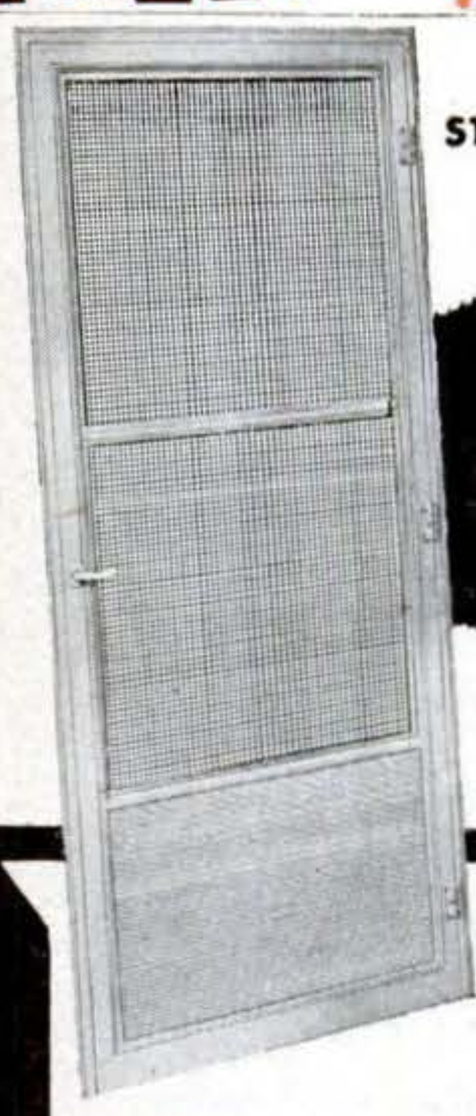

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650x16	5.75	670x15	5.05	700x17	9.85	750x20(8)	12.55
650x16(6)	6.75	710x15	5.65	750x17	10.65	825x20	18.15
700x16	6.45	760x15	5.85	750x15	10.55	900x20	17.15
750x16	6.95	800x15	6.75	825x15	11.95	1000x20	18.35
525x18	4.85	820x15	6.65	600x20	8.65	1100x20	18.35
550x17	4.45	670x16	6.15	650x20	10.65	1000x22	17.35
650x15	5.05	760x16	6.55	32x6(8)	10.35	1100x22	17.35
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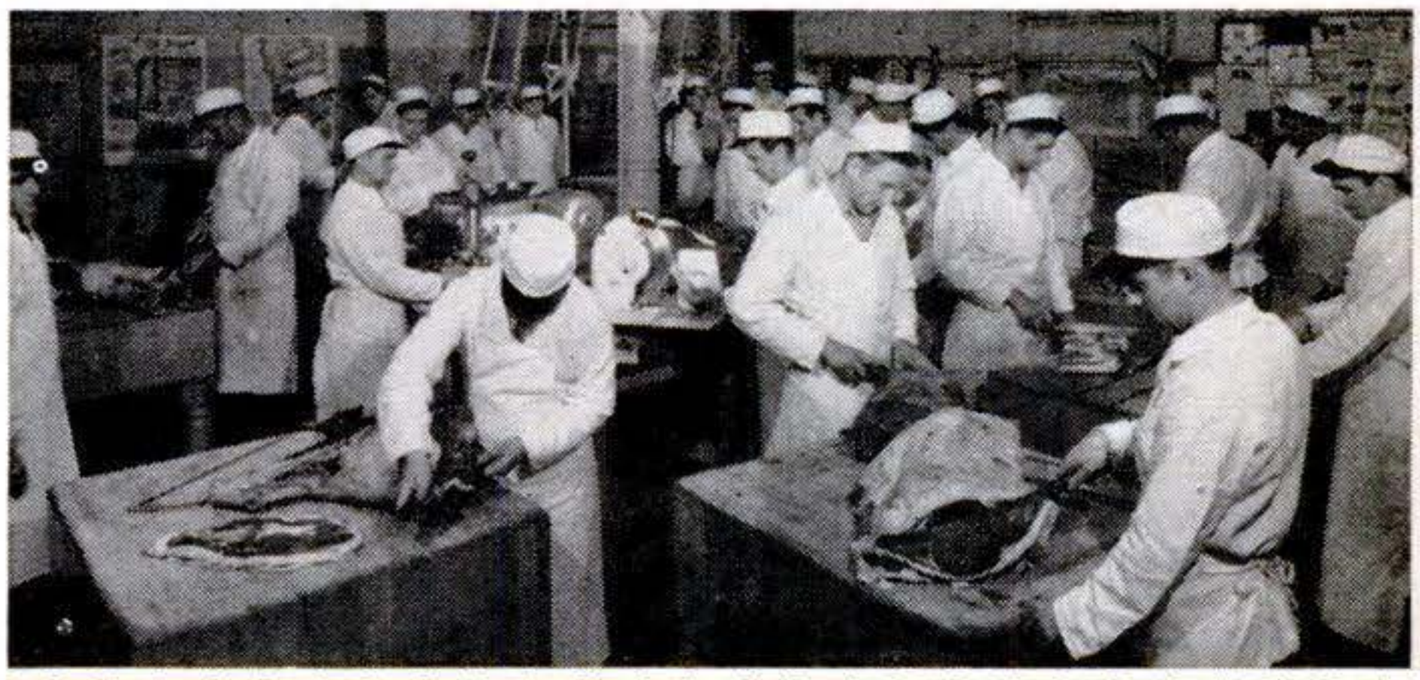

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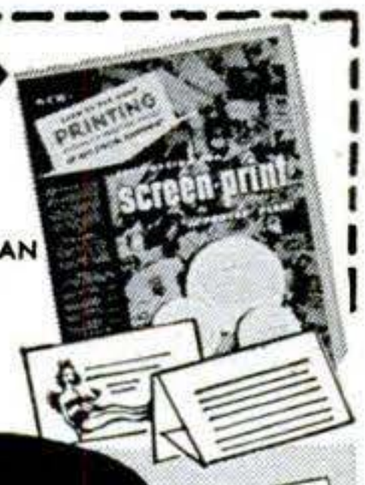

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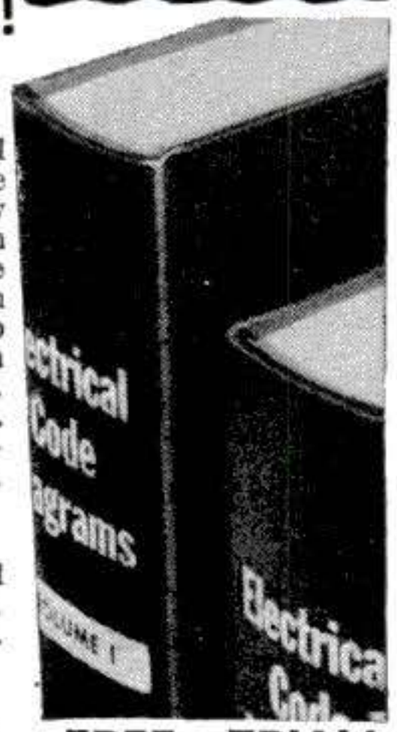

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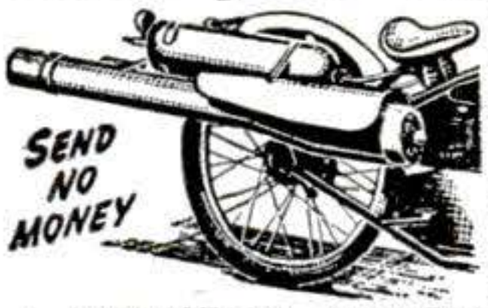

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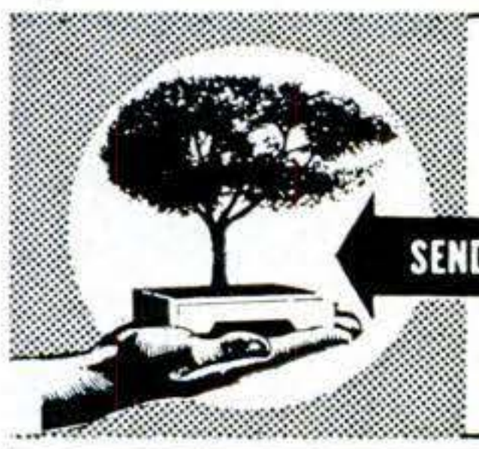

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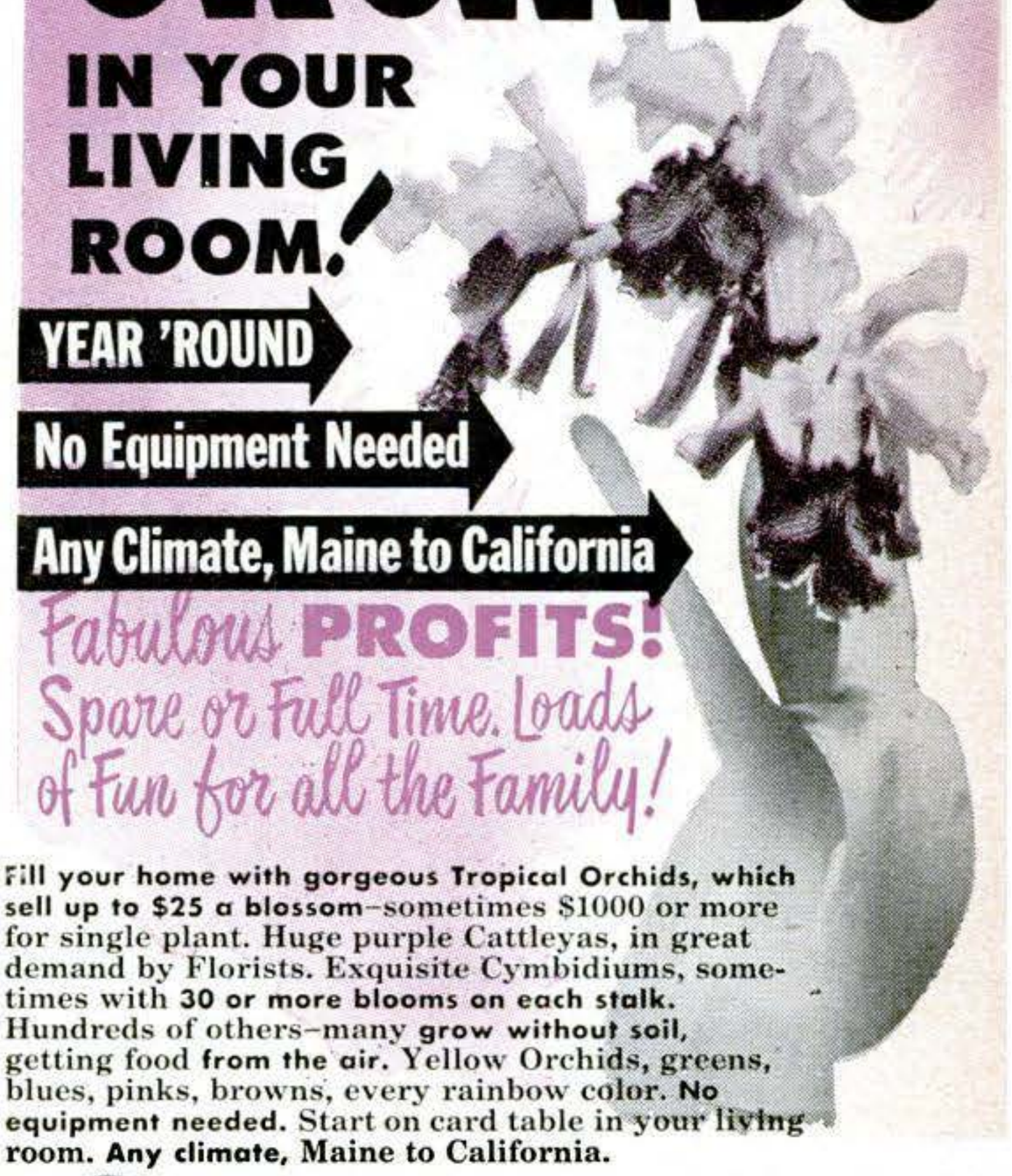

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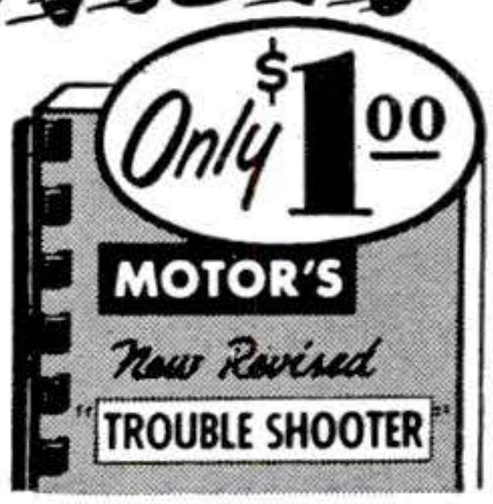

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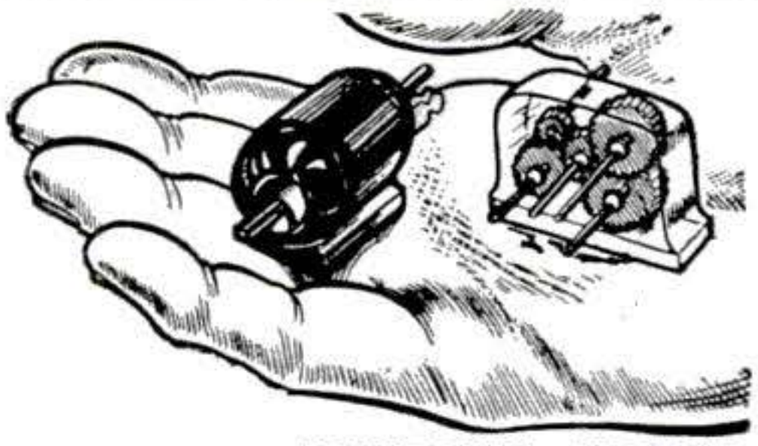

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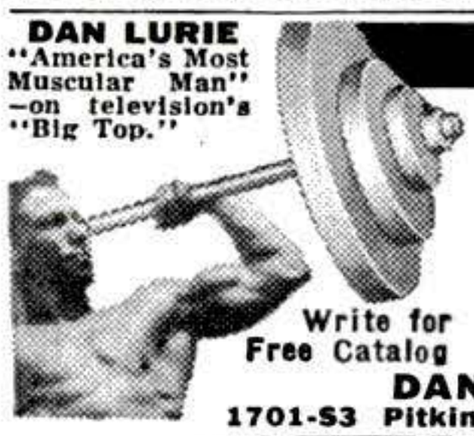

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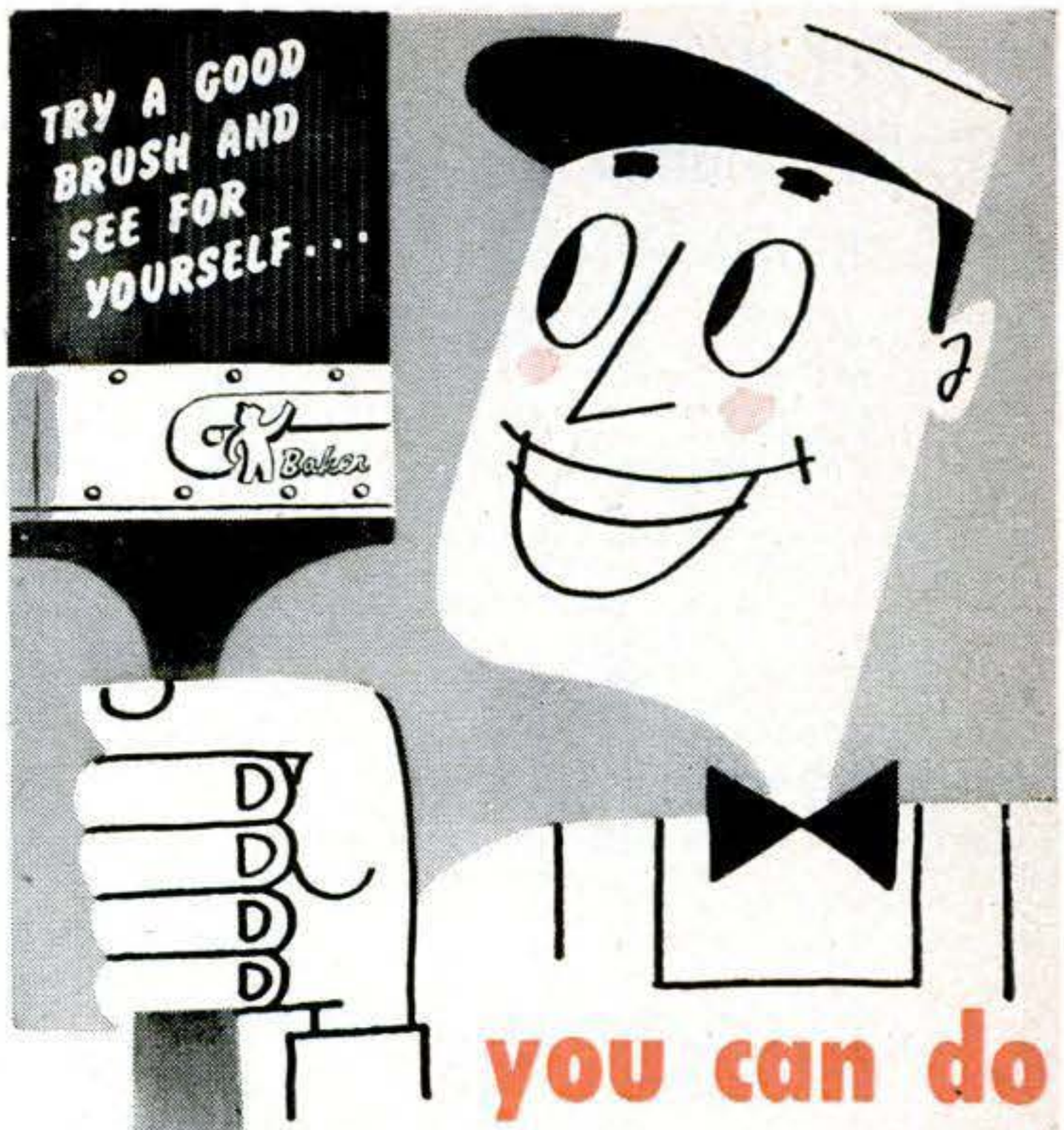

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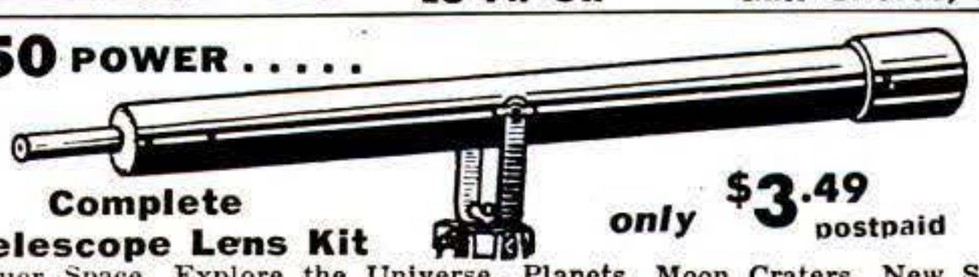

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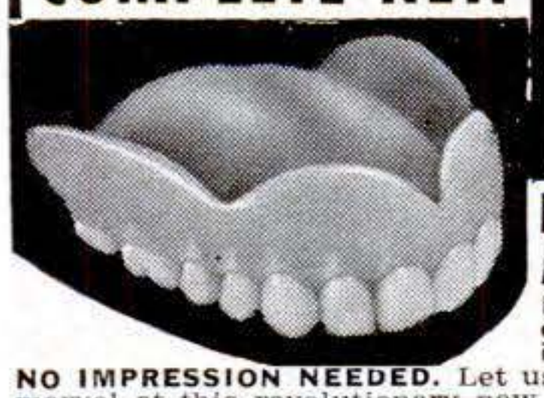

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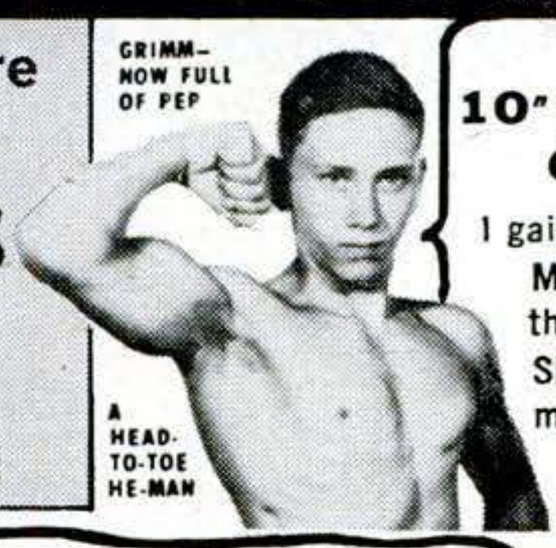

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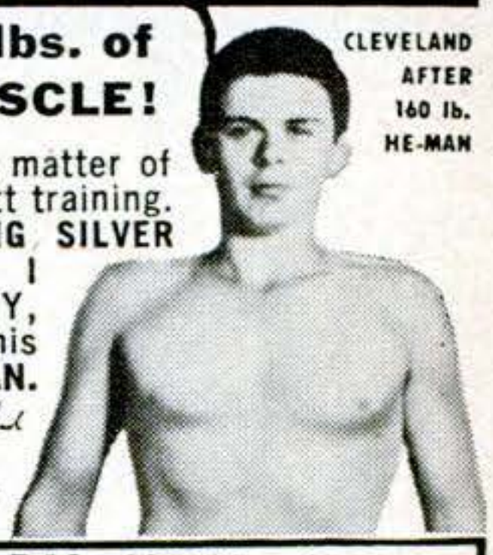

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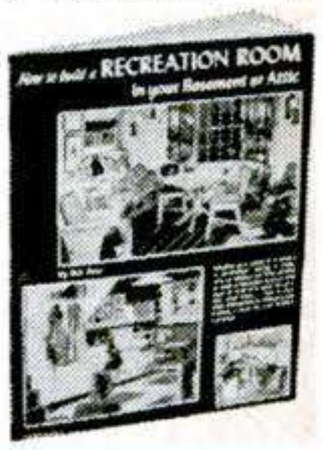

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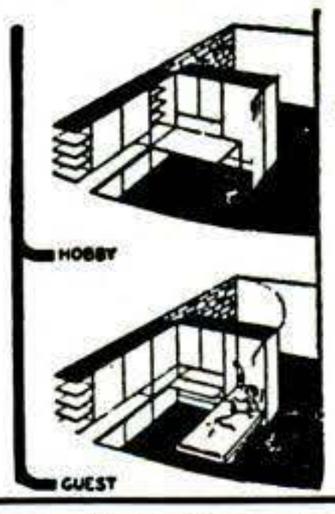

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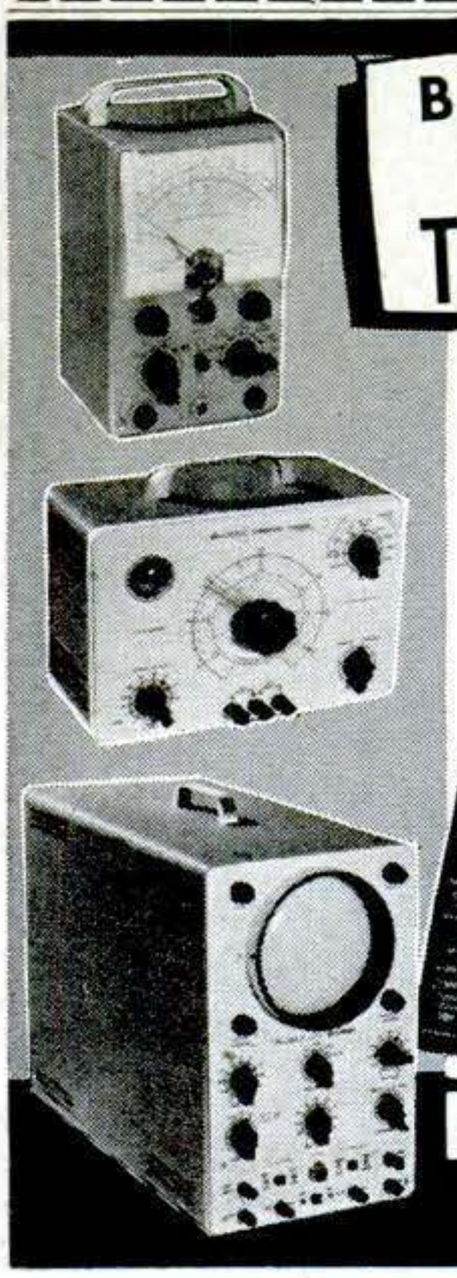

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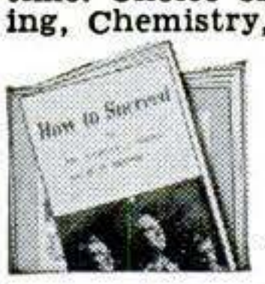

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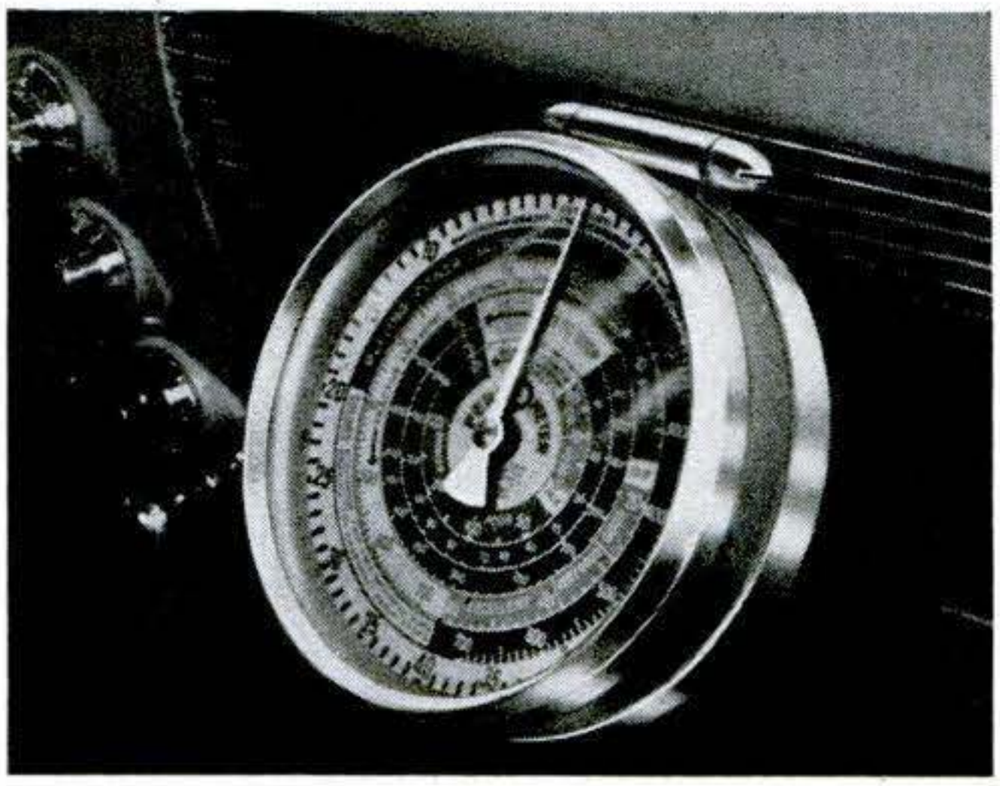

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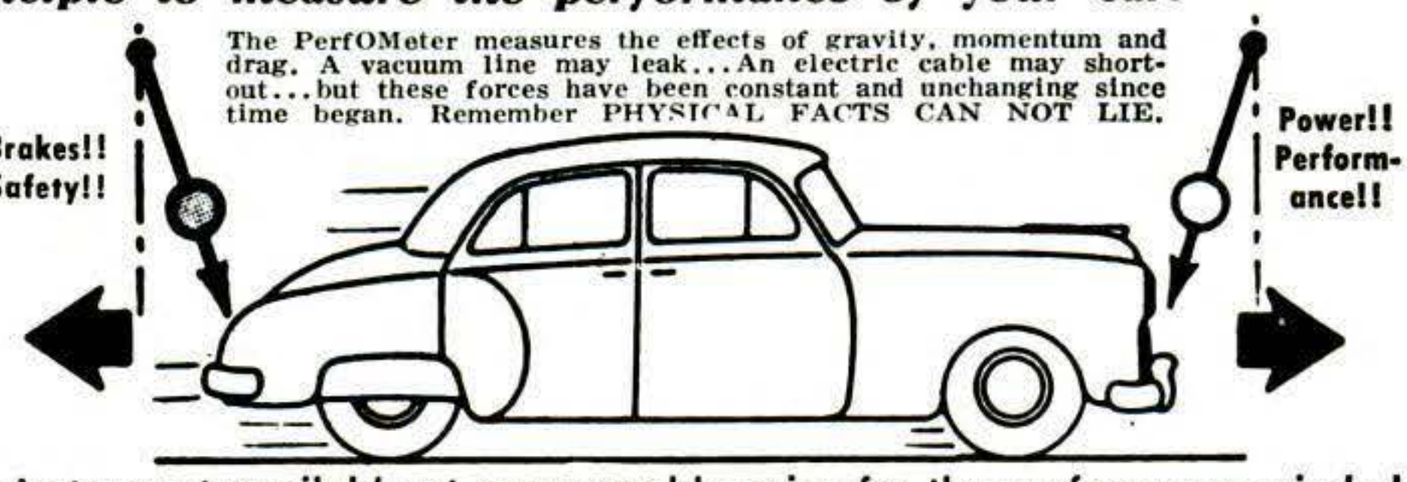

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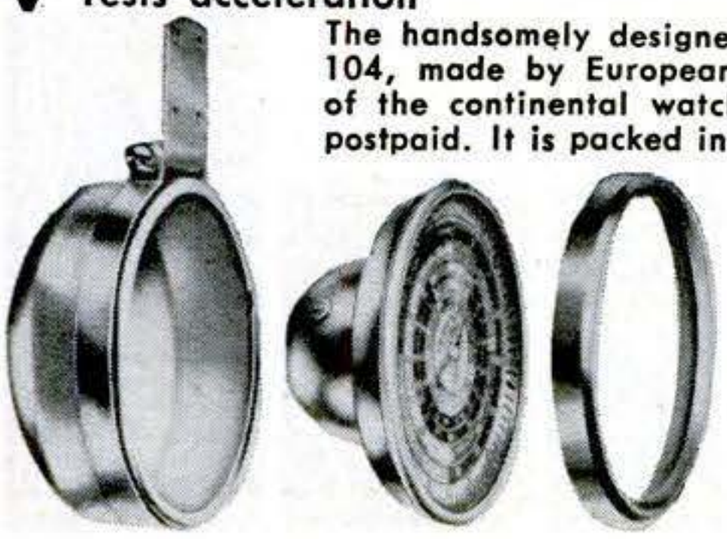

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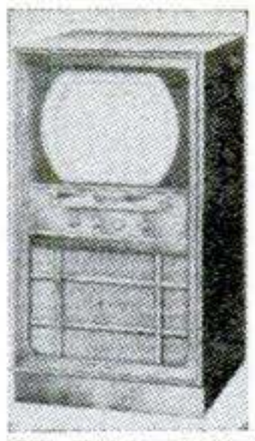

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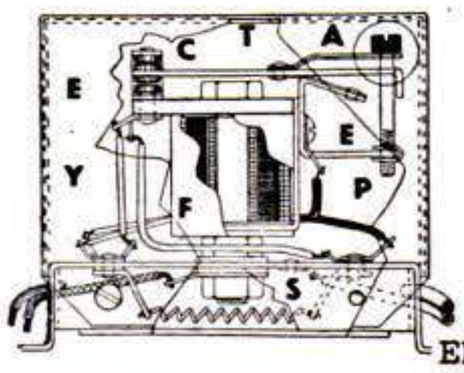

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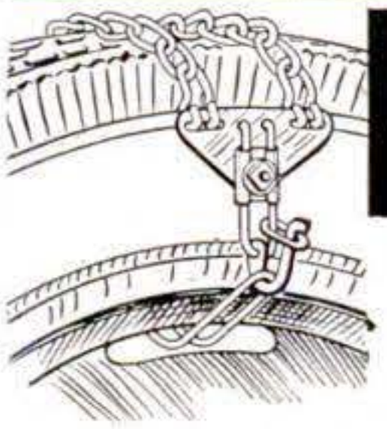

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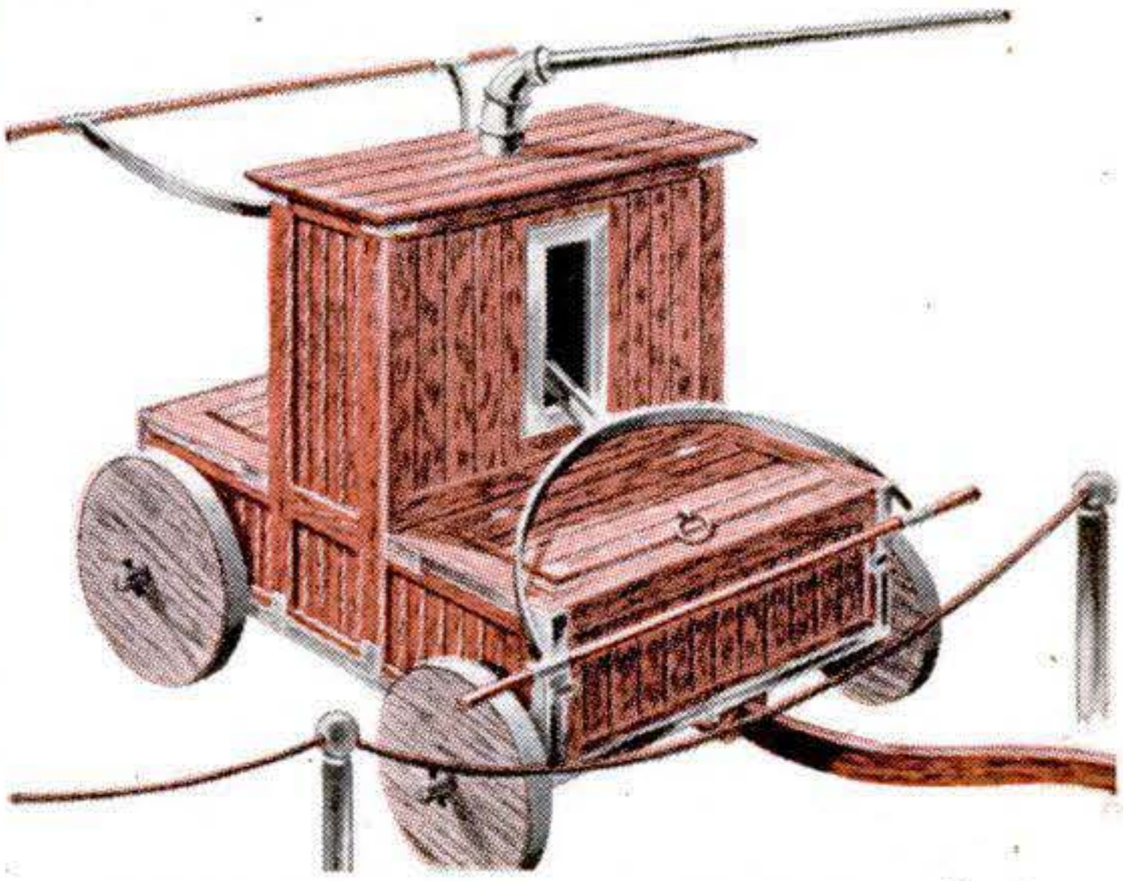

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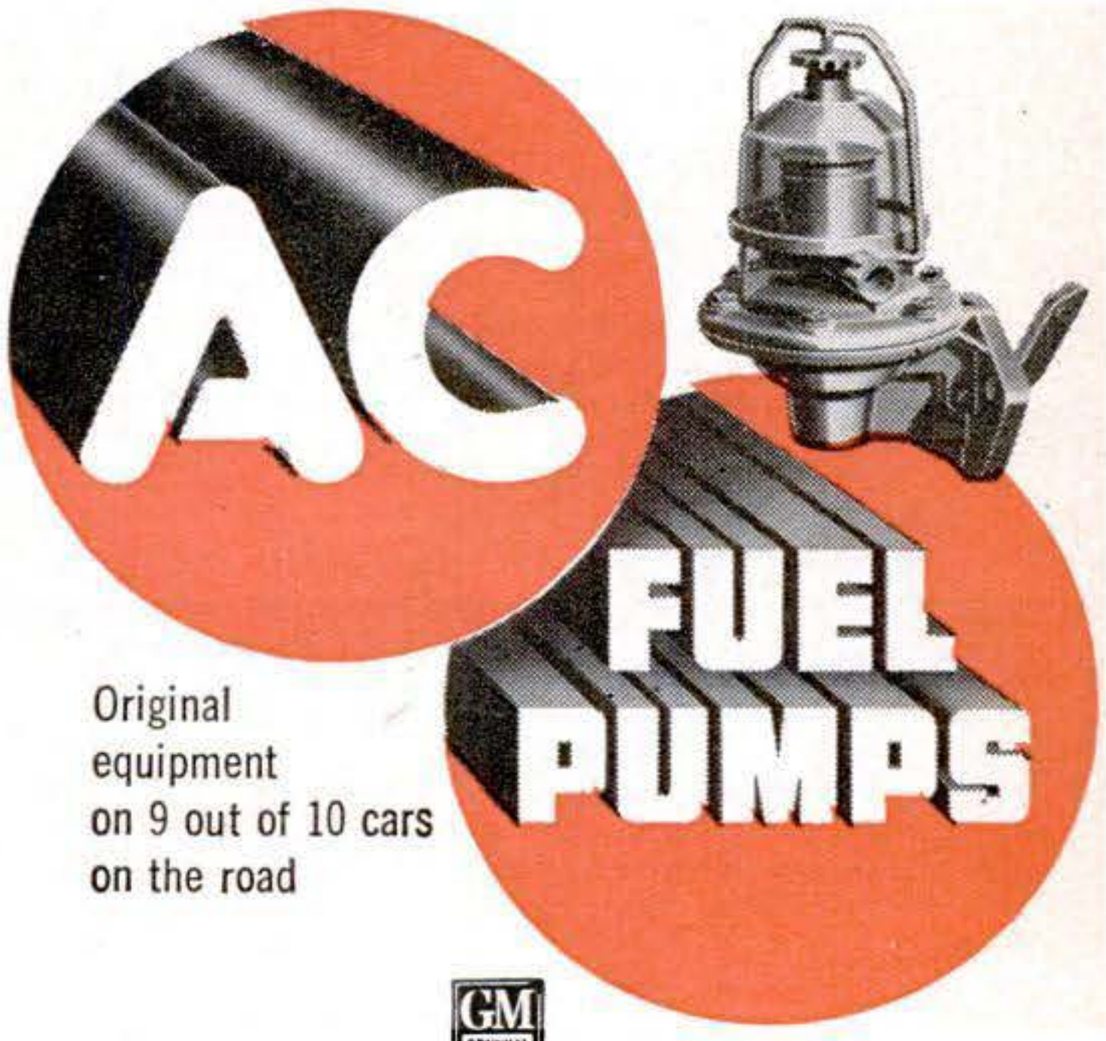

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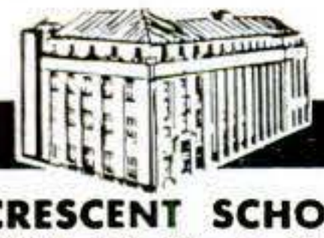

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700x16	7.75	700x15	5.75	700x20	12.50	1100x20	26.75
750x16	12.5[illegible]	710x15	6.50	32x6 (8)	11.95	1000x22	19.50
550x17	5.75	760x15	6.95	32x6 (10)	12.75	1100x22	24.75
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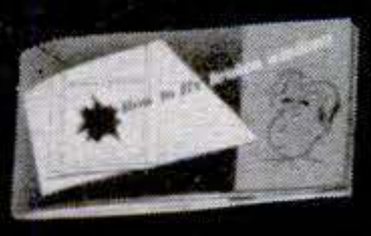

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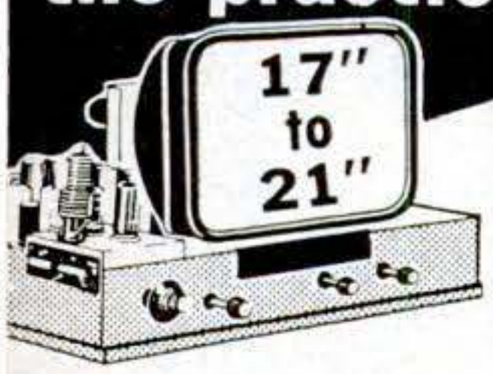

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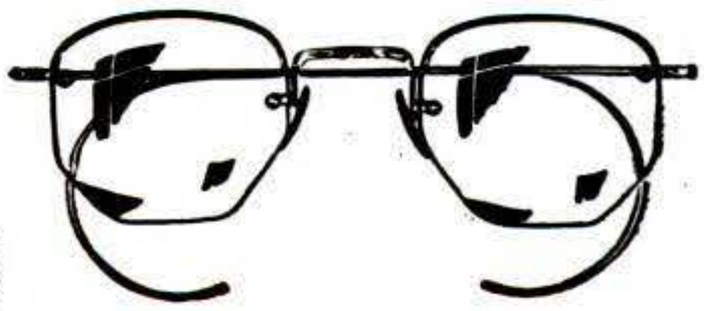

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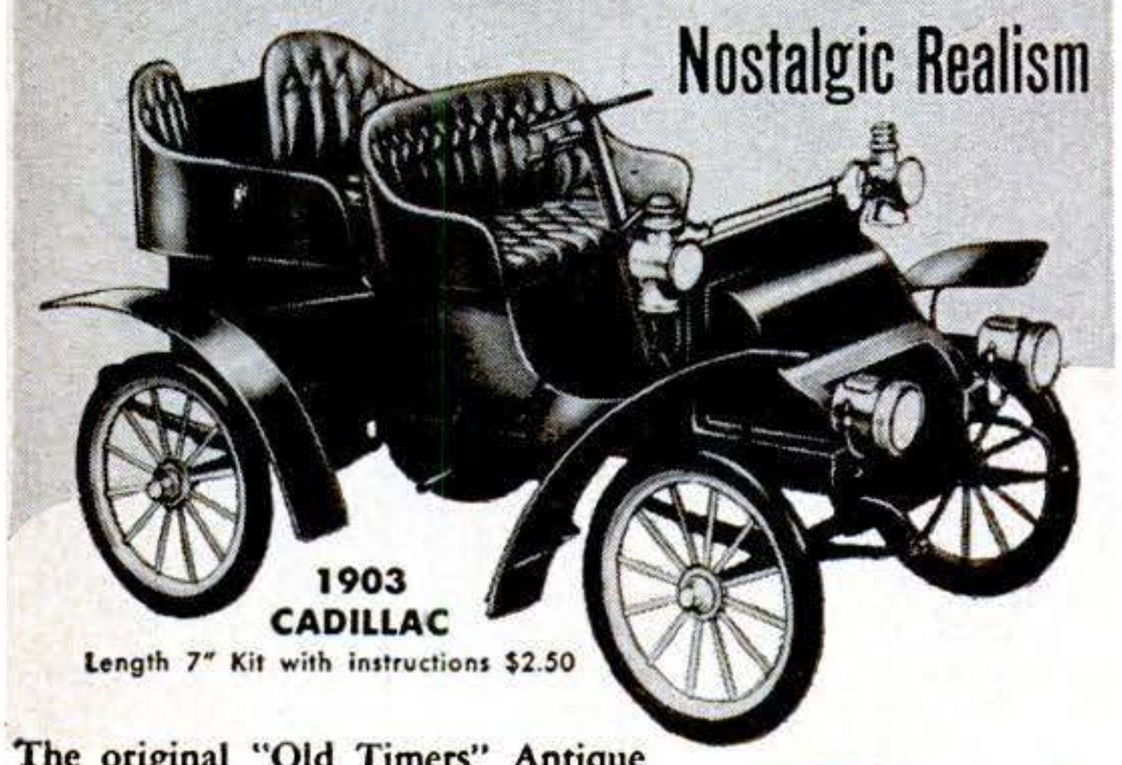

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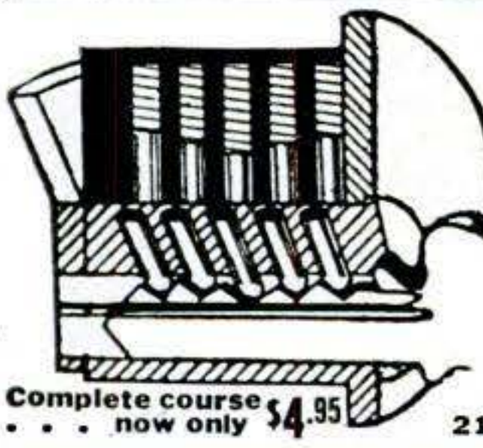

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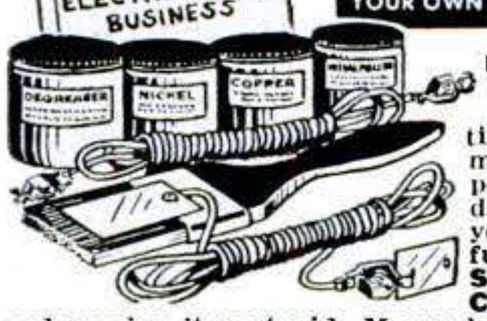

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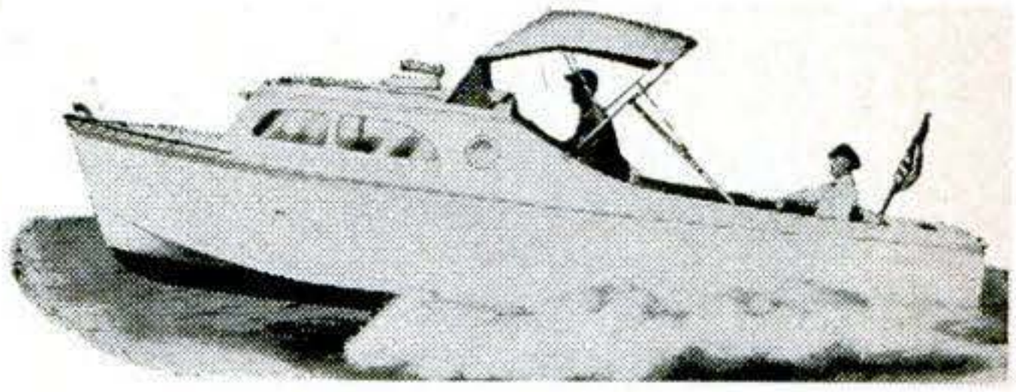

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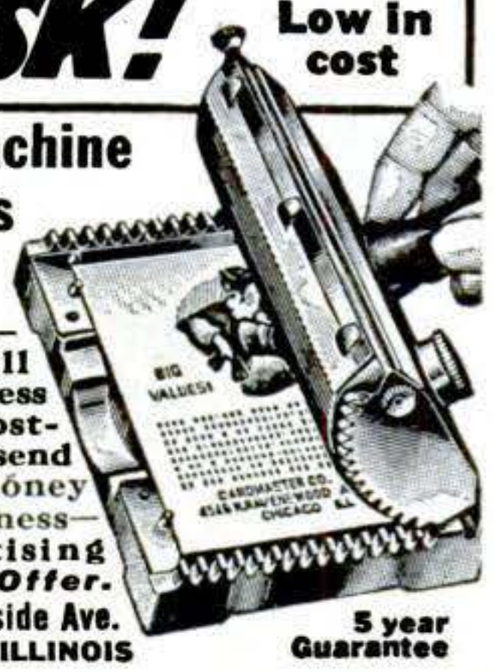

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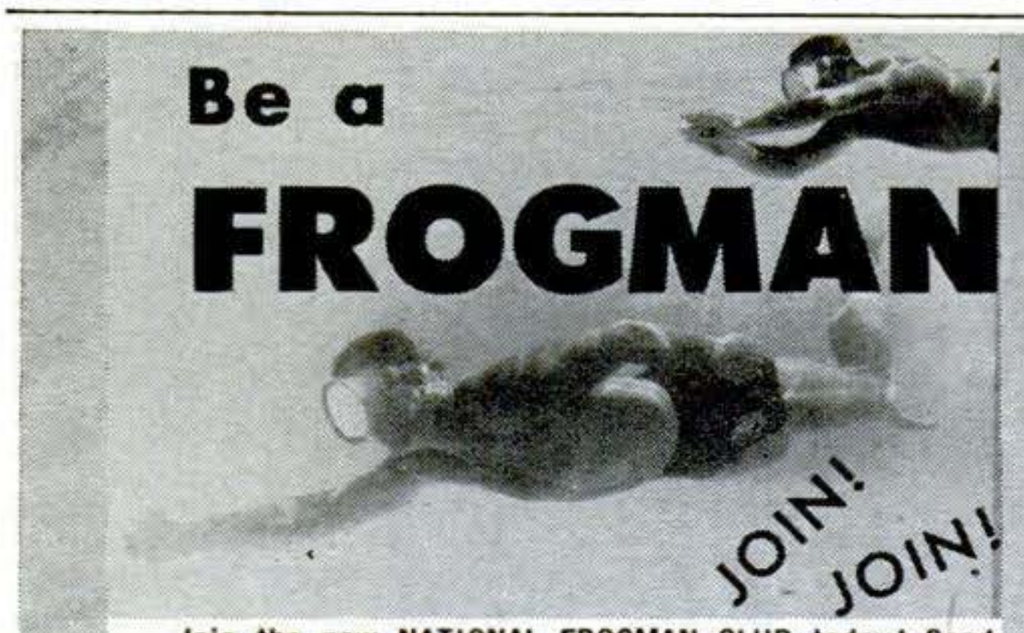

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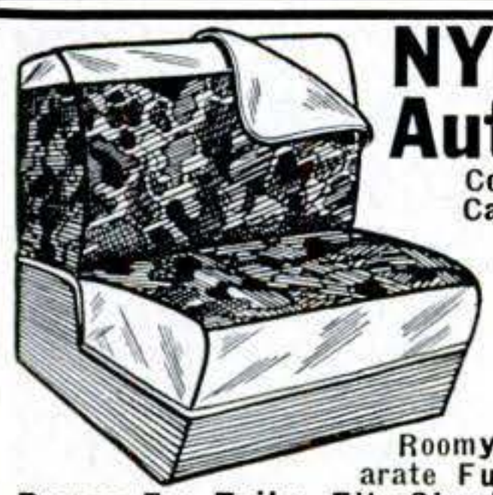

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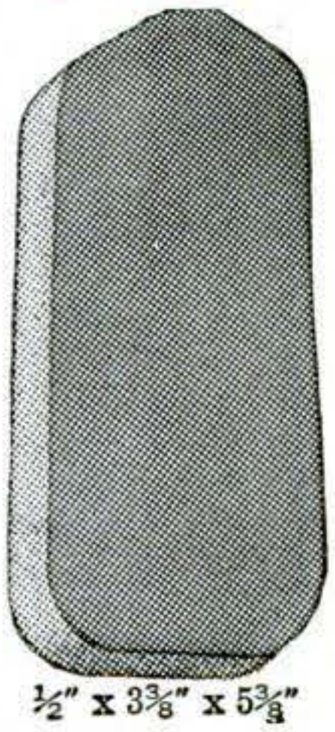

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Miss Stenz does not claim to grow hair in 20 minutes. The story, titled by Vue Magazine editors, deals with her demonstration — made many times, for many people—that even entirely "bald" heads often have considerable live hair, completely grown over by membraneous tissues, which ordinary scalp treatments do not penetrate. Microphotographs in the Vue article show that when this tissue is penetrated by a 20-minute Stenz treatment, hair may appear dramatically over a considerable portion of the formerly bare scalp.

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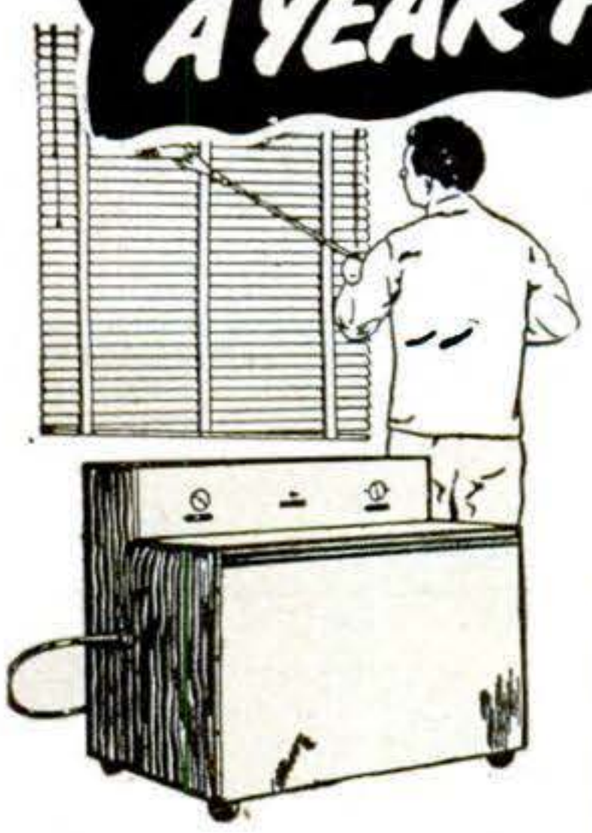

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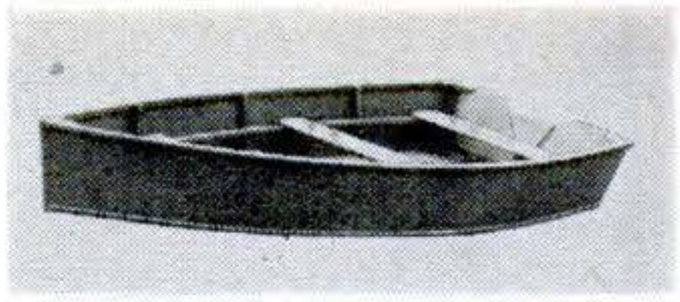

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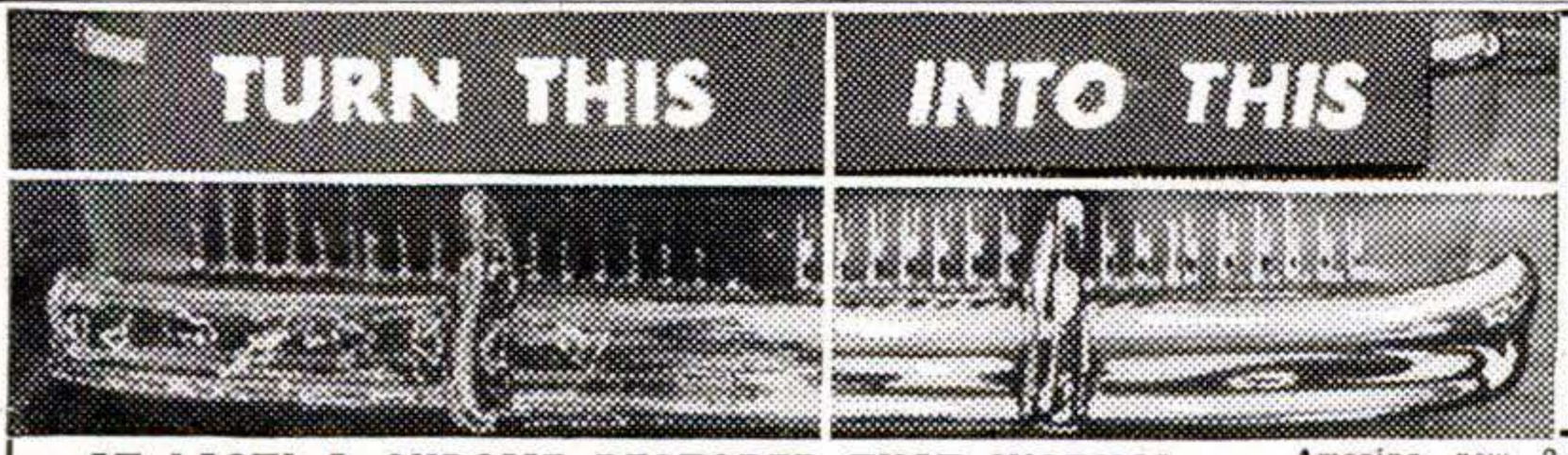

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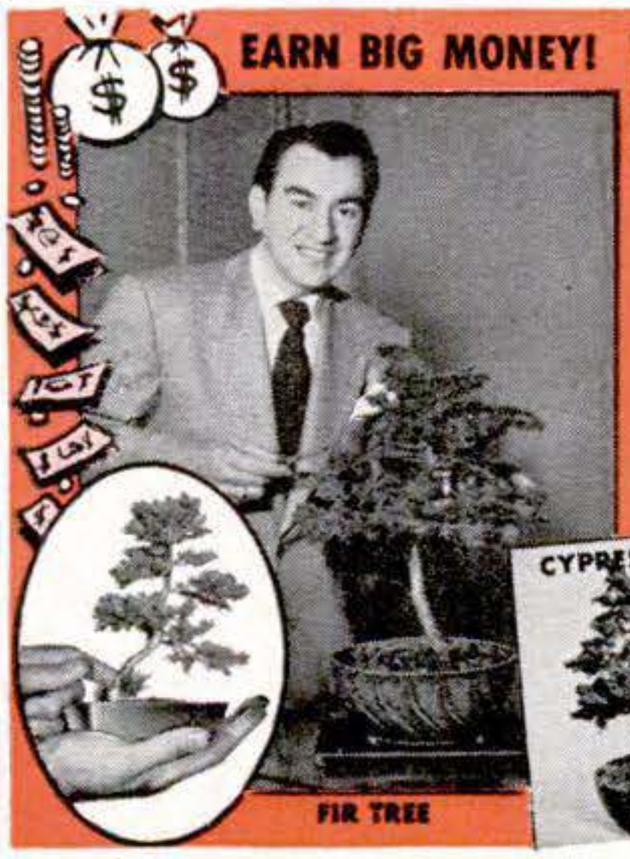

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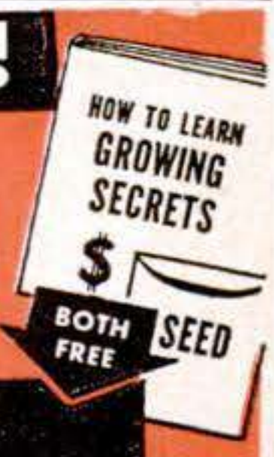

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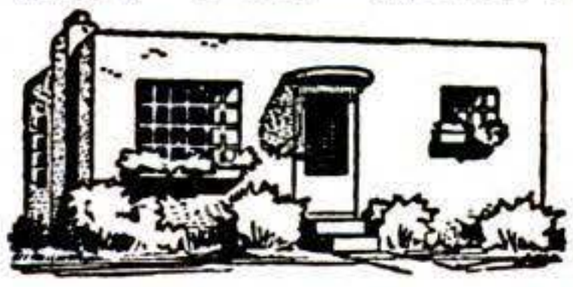

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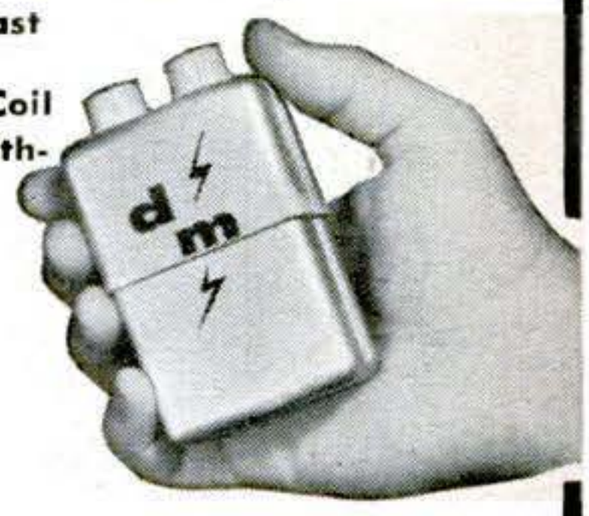

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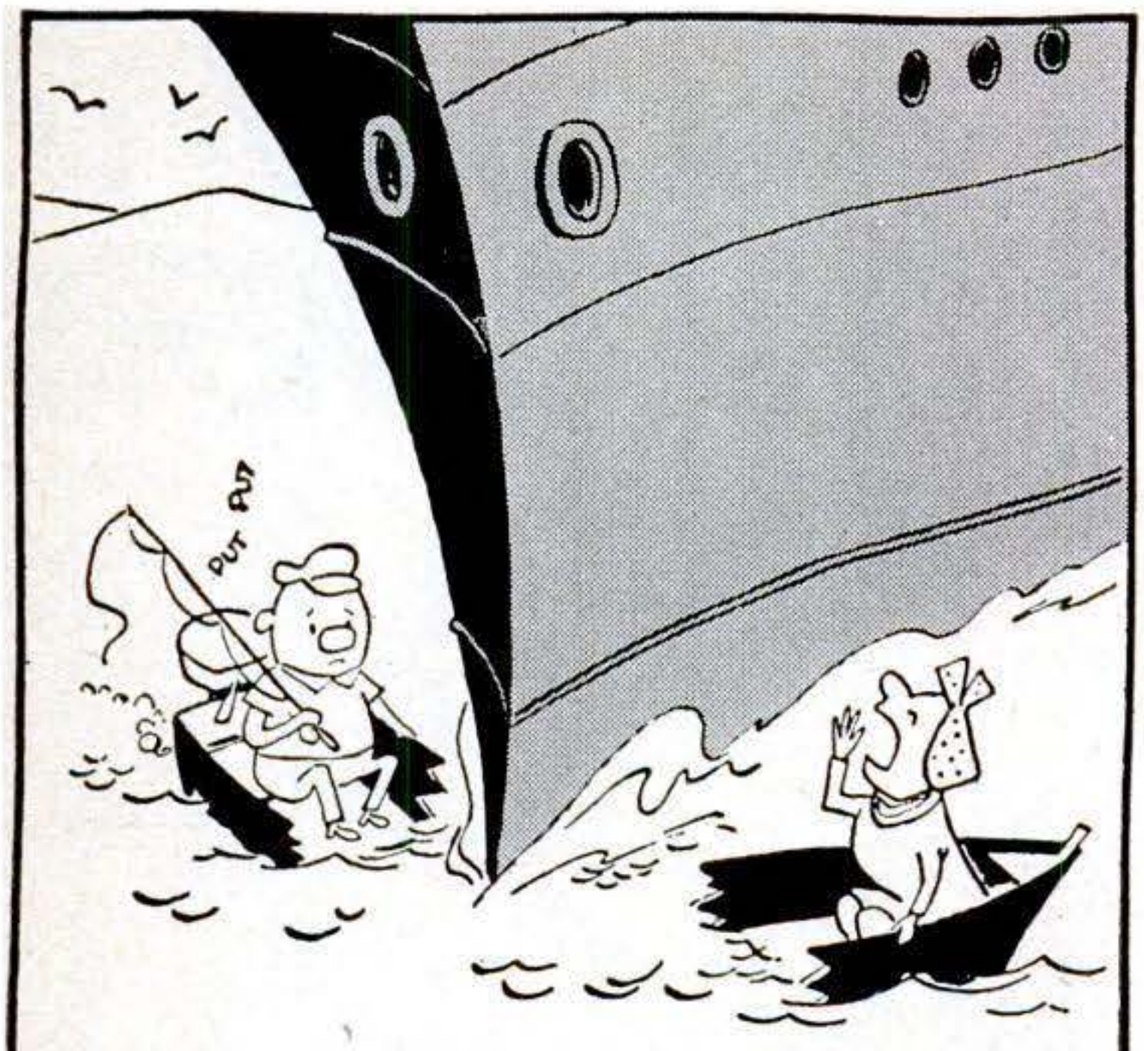

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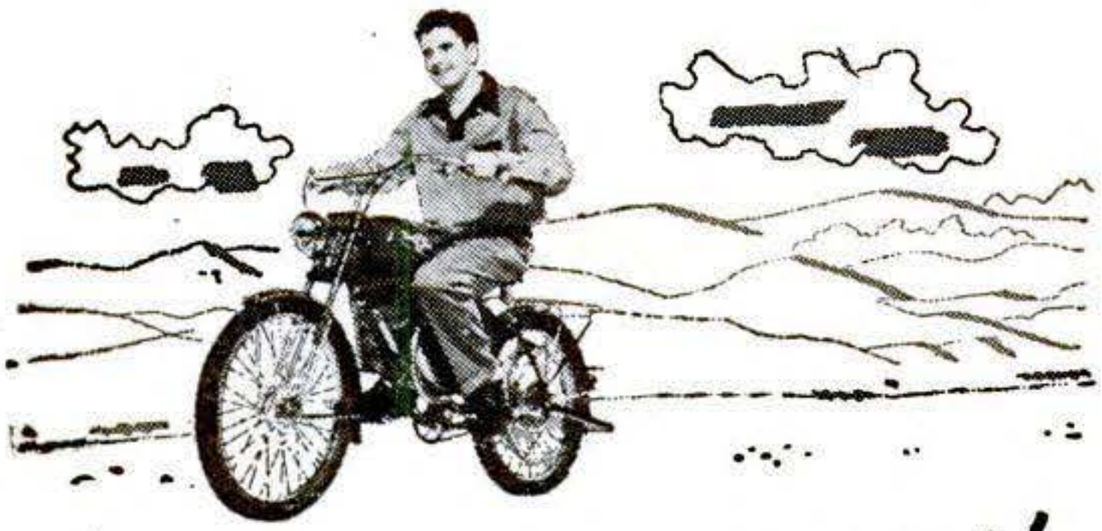

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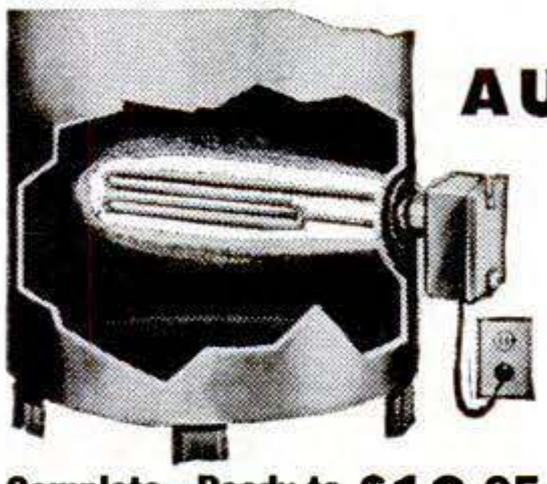

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New, UL approved LECTROMATIC changes gas, coal or oil-burning water heater into modern ALL-ELECTRIC unit! Turns on automatically when needed, shuts off automatically when water is heated. To install, simply shut off water.

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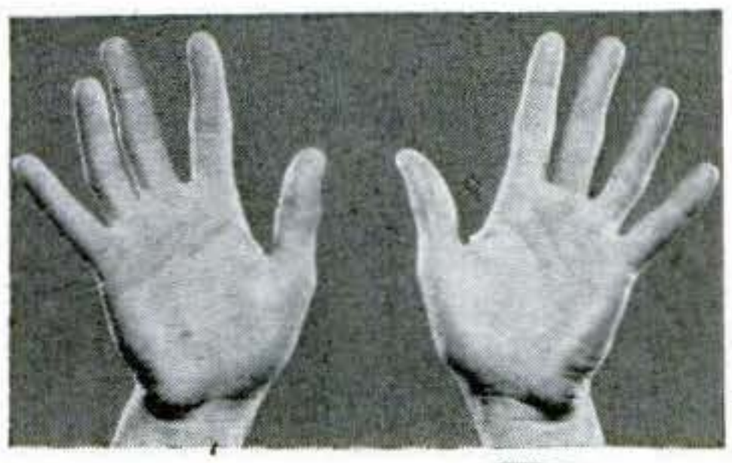

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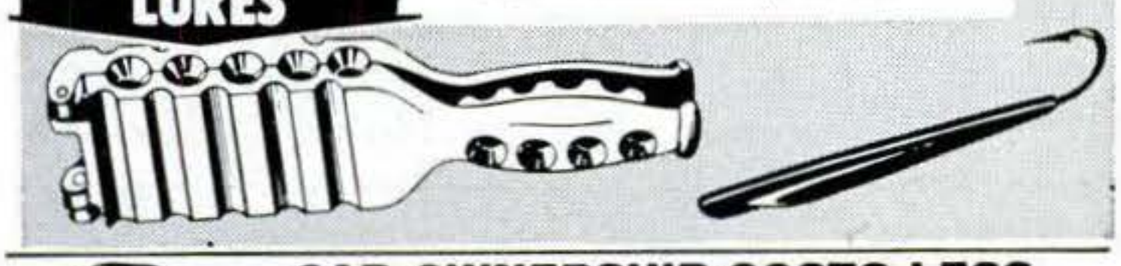

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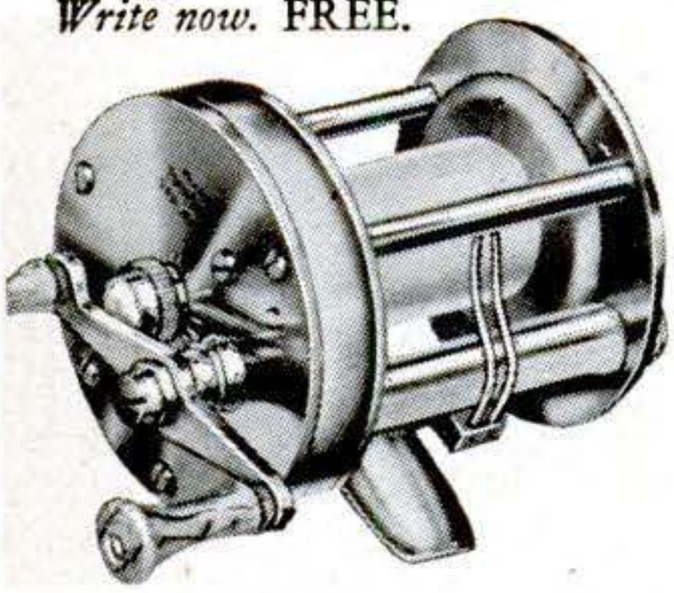

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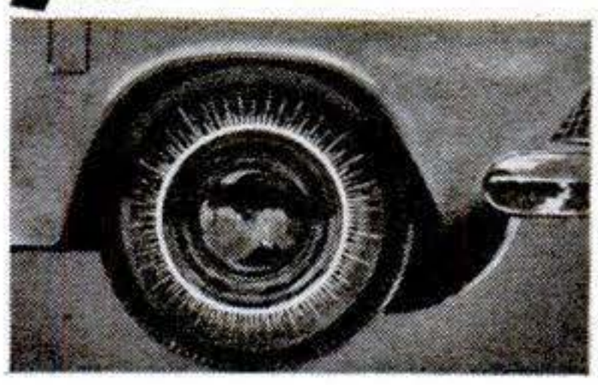

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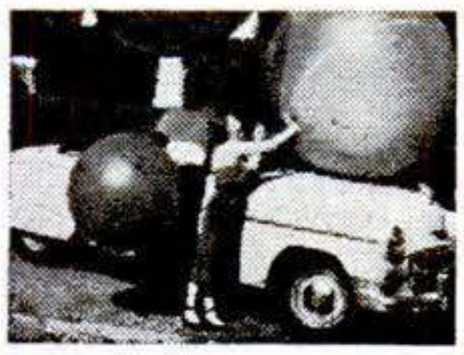

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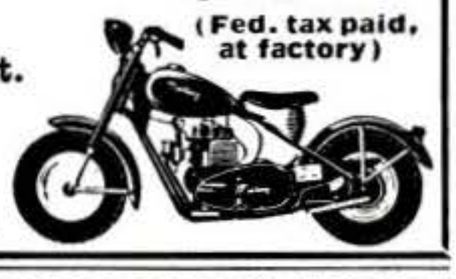

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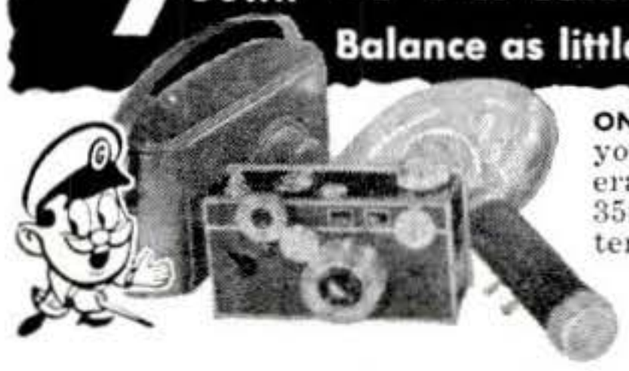

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WEEGEE'S SHORTCUTS TO PRIZE WINNING PHOTOFLASH PICTURES

#1...Fast focusing for action shots

BY WEEGEE

Weegee, the world's foremost flash photographer. Author of NAKED CITY and the-soon-to-be-released NAKED HOLLYWOOD.

Prize-winning action shots crop up in a flash. There's no time to focus or use a range finder. Yet editors demand needle-sharp pictures. Contest judges accept no others. And there's no reason why you should settle for less.

This month I'll tell you how to focus in 1/200th of a second. How? Simply keep your camera set for 10 feet at f16 indoors. It's perfect for most pictures. Change to 6 feet at f22 for close-ups. When outdoors, I shoot 10 feet at f11 and 6 feet at f16.

I practice judging distances with two objects, one exactly 6 and the other 10 feet from my favorite chair. While relaxing or reading, I glance up and concentrate on these distances. Try it. With a little practice you can guess these lengths to the inch. But don't try to guess the entire scale on your camera. After 20 years I still can't.

Here's another tip. Cameras are a matter of choice. Flash bulbs are not. I and most of my friends who earn our living with a camera, insist on Westinghouse flash bulbs. Westinghouse bulbs give all the flash you need to freeze the fastest action. I even use them in my daytime shots. And I can honestly say my new book, "Naked Hollywood," could never have been done without dependable Westinghouse flash bulbs.

Fast focusing, plus other secrets I've picked up in 20 years of photography, are described in a new booklet, WEEGEE'S SECRETS OF SHOOTING WITH PHOTOFLASH. This booklet is not for sale. You can't buy it at any store. But you can get a copy with the wrapper from a carton of Westinghouse flash bulbs. Mail the wrapper and coupon below with 25¢ to cover postage and handling.

Next month I'll tell you how I get "naturalness" even in posed flash pictures.

YOURS FOR A WESTINGHOUSE FLASH BULB CARTON WRAPPER AND 25¢

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- Putting character into portraits
- Drama in news photographs
- Selling your pictures
- Photographer's place at a fire

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WESTINGHOUSE LAMP DIVISION, DEPT. PS-3
Bloomfield, New Jersey

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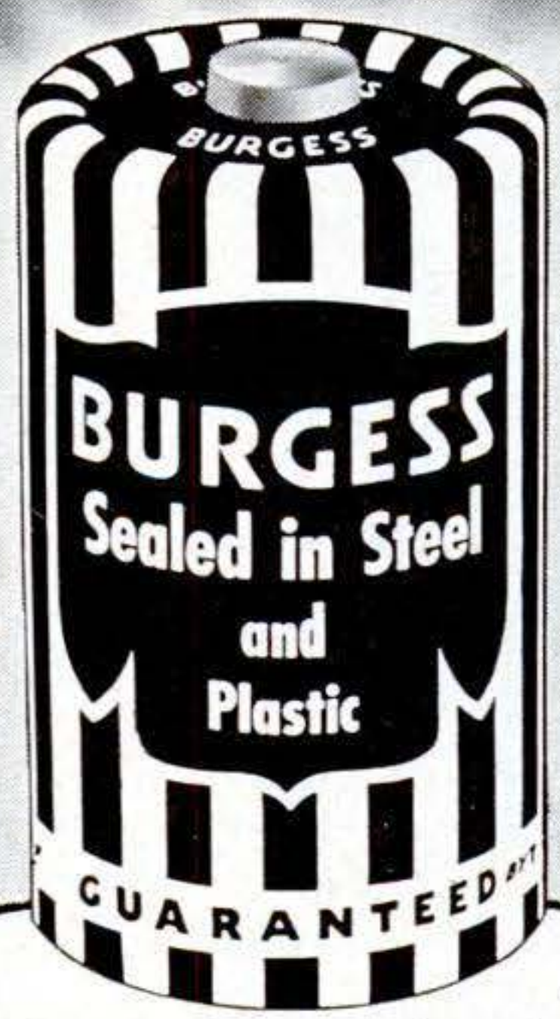

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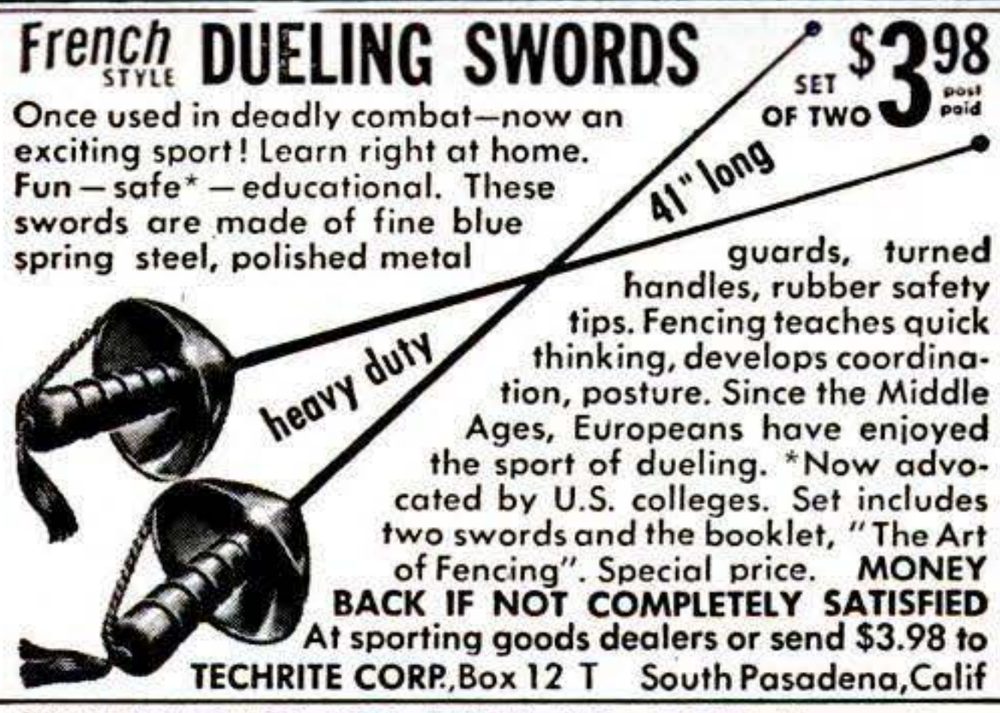

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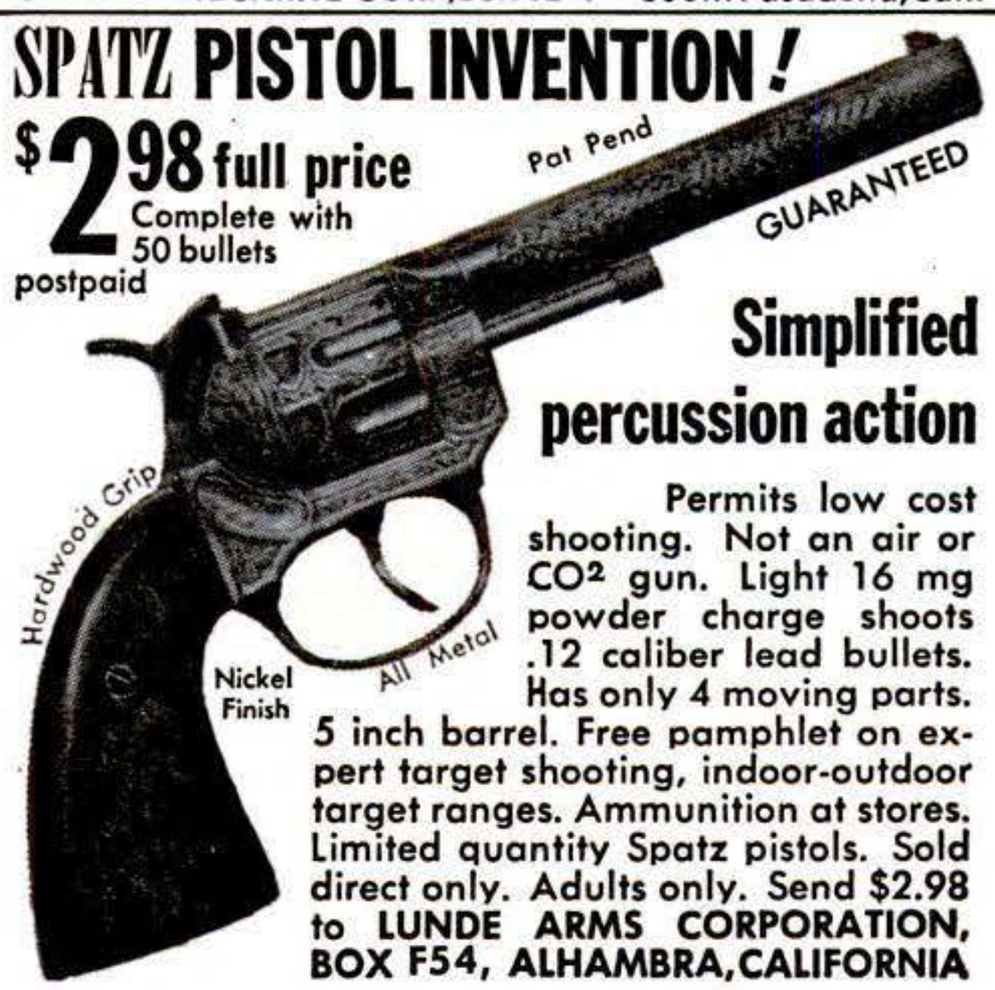

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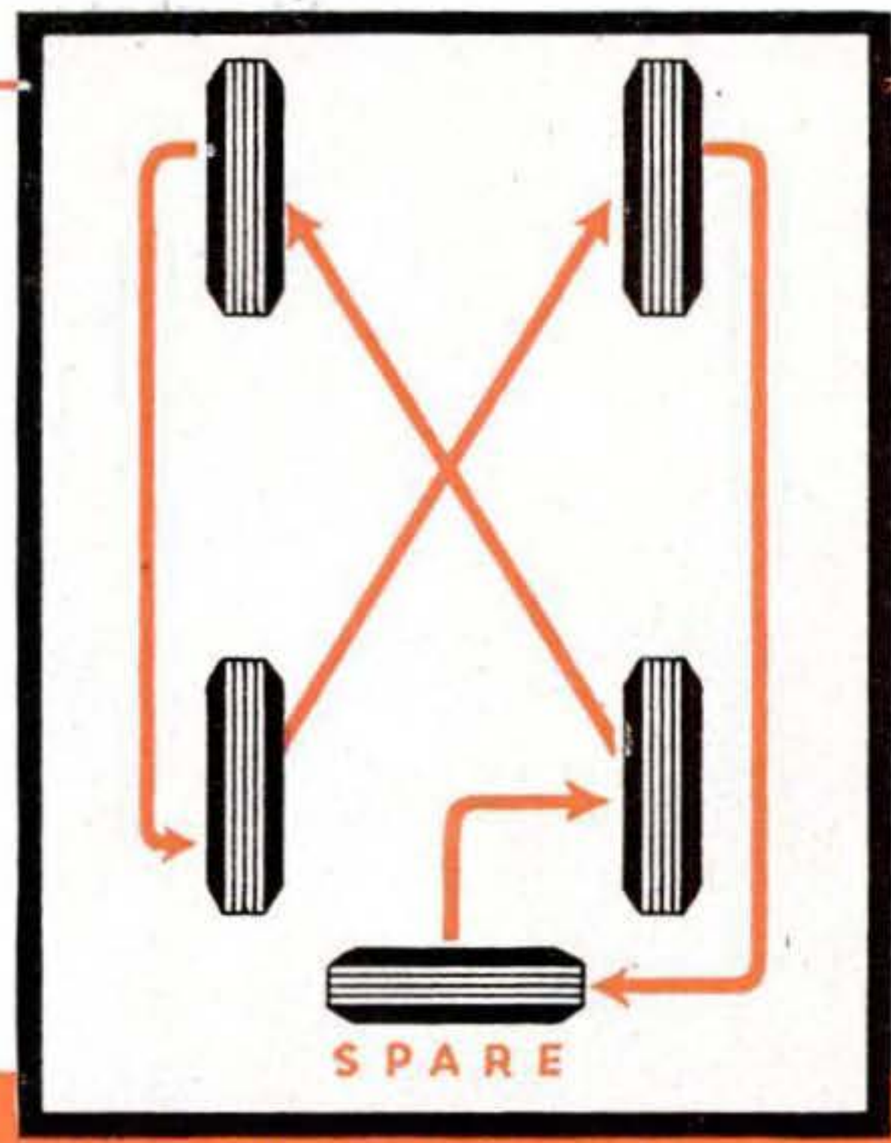
Texaco Tips on car care



How to get longer tire life

When your tires wear unevenly, they don't give you full service. To get maximum mileage from your tires, they should be inspected often and rotated. See your Texaco Dealer for a thorough tire check. He will inspect the treads for irregular wear. He will check for trouble-making cuts and breaks . . . and fill your tires to the proper pressure. He will rotate them for a nominal fee. This helps you enjoy *more* miles of carefree motoring.

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Announcing the New 1953 Studebaker

The new American car with the European look

CHAMPION ★ COMMANDER V-8

The Starliner coupe—less than five feet high! A far-advanced new flight into the future!

HERE is the most daring step forward of our times in automobile designing—a car sparkling with breath-taking originality . . . the new 1953 Studebaker.

This is the first American car with a real foreign-car flair—an impressively long and racy Studebaker that's so very low most people can see right over it.

Stop in at a nearby Studebaker showroom and try out this exciting new car. A truly marvelous power steering is available in the Commander V-8 at moderate extra cost.

Over 100 Years of Studebaker Progress on the Roadways of the World

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Model railroading's huskiest "Diesel," this Griffith Park, Los Angeles, midget develops 44 hp.

5,000 Railroads Run for Fun

Back-yard Casey Joneses are making the lilac bushes resound to the whistles of live steamers and gasoline-powered "Diesels."

By Henry B. Comstock

MODEL railroading is moving outdoors. You can blame it on atticless and cellarless houses, high fire-insurance rates, or the yen of the average rail fan to chuff around behind his own locomotive. Whatever the cause, there are more than 5,000 sky-topped model railways in the United States today. They range from little half-inch-scale pikes that wind through Alpine gardens on a ballasting of bird gravel, to a jumbo system whose coal-fired locomotive towers eight feet to the rim of the stack.

Between the two are more gauges than the 30 which once plagued the world's big-time railroads. That is because your back-yard Casey Jones is a rugged individualist. He builds most of his equip-

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SOUTH CAROLINA

Golden Spike ceremony on Elliott Springs' Lancaster & Chester. The engine at left ran at

TWO AIR-COOLED, V-4 MOTORS highball the Griffith Park streamliner around 3,000 feet of track at 30 miles an hour. Each powers four axles through a fluid drive.

ment from scratch to his own specifications.

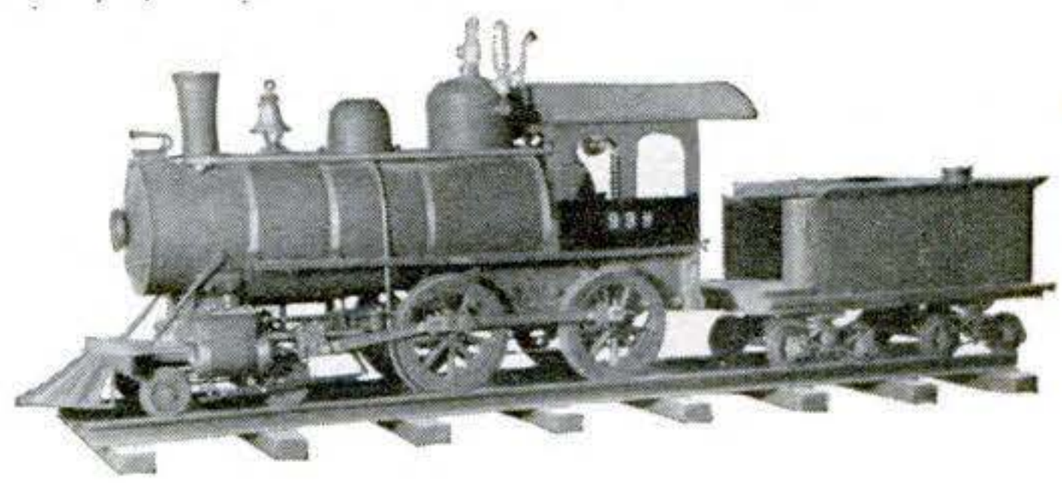
If he is an old-timer, he may have latched onto a discarded amusement-park engine. Most of these sturdy live steamers, built by Cagney or the New York Locomotive Works, went at bargain prices 20 years ago, when their commercial owners switched to gasoline-engine-driven jobs. Today they are collectors' items.

One of them, well known to thousands of motorists passing through Stony Point, N. Y., is believed to be the only miniature engine ever involved in a train robbery.

Live steamer below cost $15,000, attracts guests to the dairy of Henry Becker & Son.

NEW JERSEY

the Charleston Exposition in 1902.



Grandpa Rode Behind It

Amusement-park engines put model railroading in the passenger-hauling business. Under-scale wheels and broad driving tires gave them more power than good looks, and it took an asbestos skull cap to ward off sparks and cinders. Today, park railroads use gasoline engines and little kettles like the "999" are collectors' items.

Stopped at gun-point at the St. Louis World's Exposition in 1904, she blew her pops in indignation while three carloads of passengers were relieved of their valuables.

A modern live steamer is no trinket for Junior's Christmas stocking. Several manufacturers offer 1½- to three-inch-scale custom-built models for $10,000 to $20,000. Pound for pound, the models cost six times as much as the last batch of full-scale steam giants built by the American Locomotive Co.

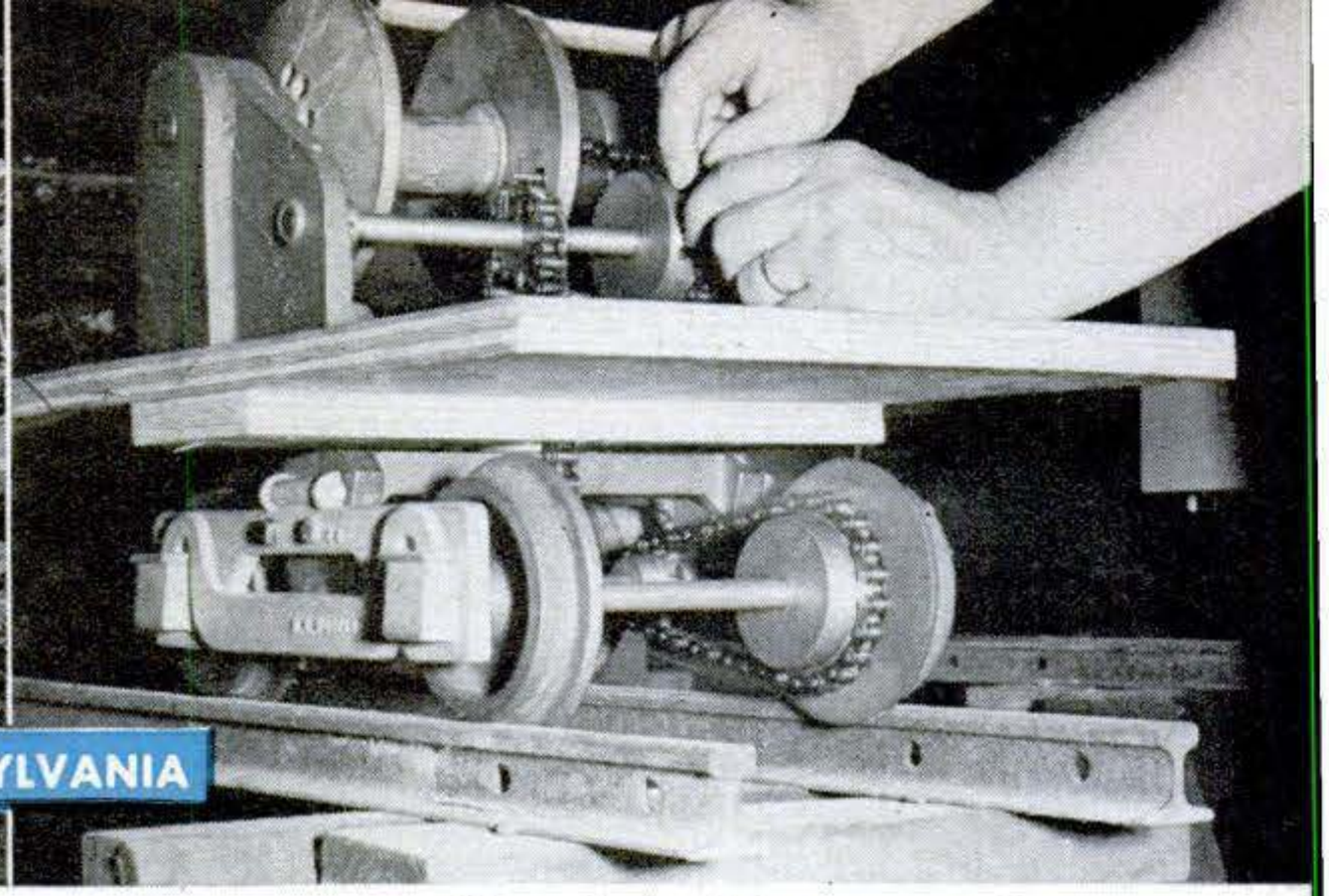
As the father-son team of Elmer and Norman Sandley, manufacturers of everything for the 15-inch-gauge garden railway, put it: "There just aren't enough Harrimans and Vanderbilts in the hobby to get us started on the quantity production methods that would lower costs."

The Sandleys are also full-time locomotive engineers on the Chicago & North Western Railway. They believe that their pint-size products could be put to real use in rural areas, trundling crops to big roads like the C&NW.

In Roseland, N. J., the 900-acre dairy farm of Henry Becker & Son uses what is probably the country's largest privately owned outdoor model railway as a novel

More than 1,750 rivets went into this streamliner built by a Minneapolis machinist.

SMALL JOB for a "Big Hook." Robert Miller's Bath, Pa., model pike makes extensive use of marine plywood for car bodies and engine cabs. Running parts are castings.



FRICTION DRUM, with a chain-drive connection to both axles, provides smooth starts for Miller's locomotives. Power comes from a one-horsepower gasoline engine.

promotion gimmick. Started as a hobby in 1938, the 1.6-mile-long "Centerville & Southwestern" now offers free rides to nearly 3,000 passengers a year.

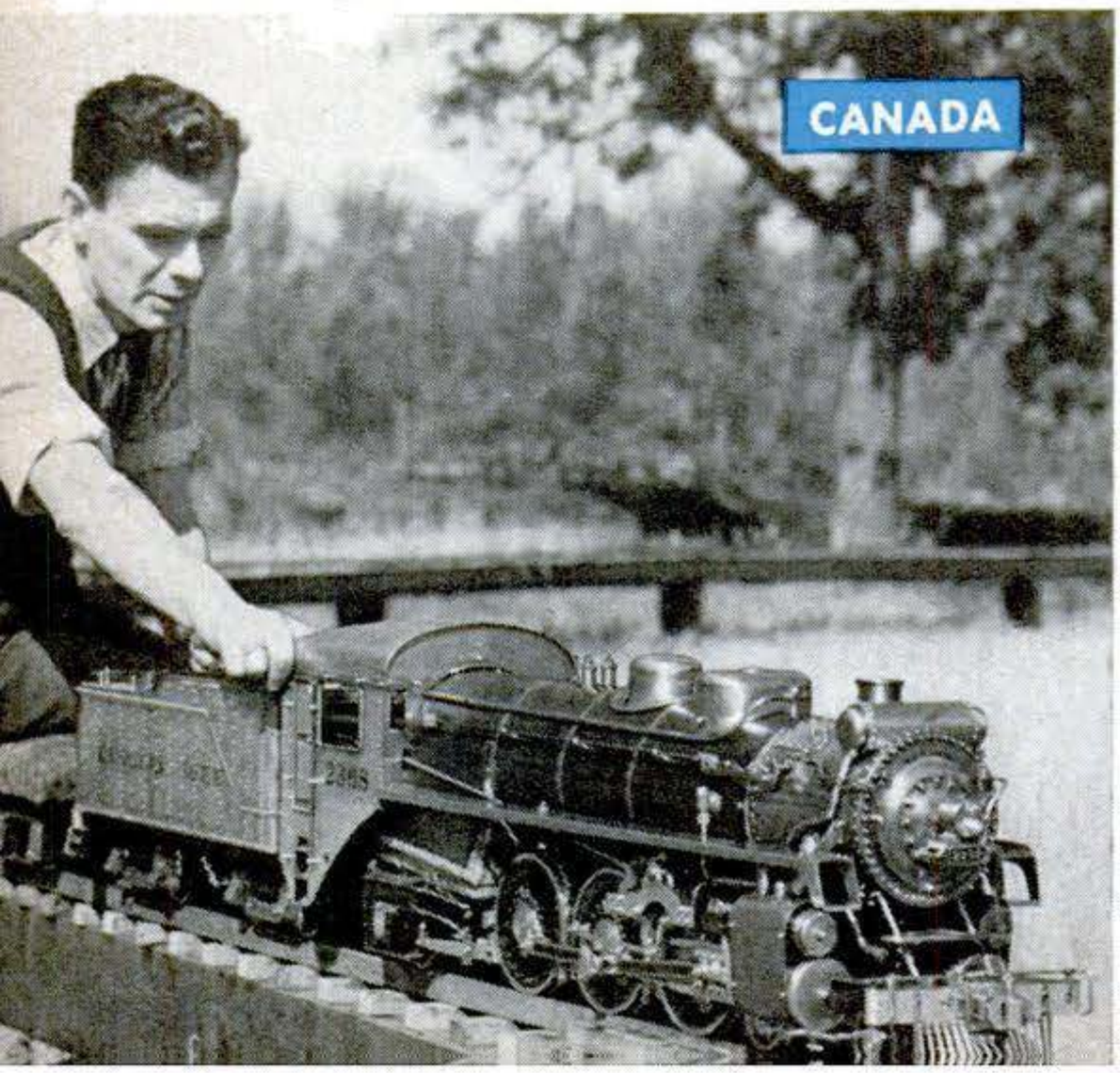
Two of the flossiest two-inch scale locomotives ever built provide iron-pony power for the 17 coaches on the dairy farm. Tops in its class is road engine 1501, a 19-foot reproduction of the big Pocono-type locomotives which once handled the heaviest "name" trains of the Delaware, Lackawanna & Western.

The Beckers' other road engine is a "Diesel." Actually, a four-cylinder gasoline engine housed in the cab of this free-lance model does the driving.

To an enterprising plumber in Creston, Iowa, go first honors for the biggest one-man model railroad ever built. Byron Hiatt was once a Chicago, Burlington & Quincy steam fitter. One boiler pipe dream led to another, and out of them came a 24-inch-gauge system laid out on a strip of farmland which Hiatt bought for only one purpose—to let him widen the throttles on the two live steamers which he has assembled from scratch.

Each of these engines is nearly half the size of its Burlington prototype. That means that Hiatt can ride inside the cab, instead of perching on the tender. A completely enclosed coach and baggage car make up the road's rolling stock, but more equipment is on the way.

POWERFUL PYGMY. Former Canadian Pacific switchman C. G. Montgomery built this ¾-inch-scale live steamer, has run it more than 2,000 miles. It pulls eight passengers.



Engine Hauls 10 Tons

Less impressive in size, but showing the same fine craftsmanship, are more than a thousand full-working steam models built to ½-inch, ¾-inch, 1-inch and 1½-inch scales by hobbyists who have more time than money to give such projects.

A few of the veteran hobbyists are now turning out blueprints, patterns and castings as a part- or full-time business. "Little Engines," founded by Martin and E. I. Lewis, is the largest outfit in the field. Biggest in their line is an $811 set of castings for a Union Pacific 4-8-4 that measures 14 feet between couplers and will haul 10 tons with ease.

Back-yard railroading would still be a luxury if General Motors and Briggs & Stratton hadn't unconsciously given the boys a financial assist. GM started the

[Continued on page 270]

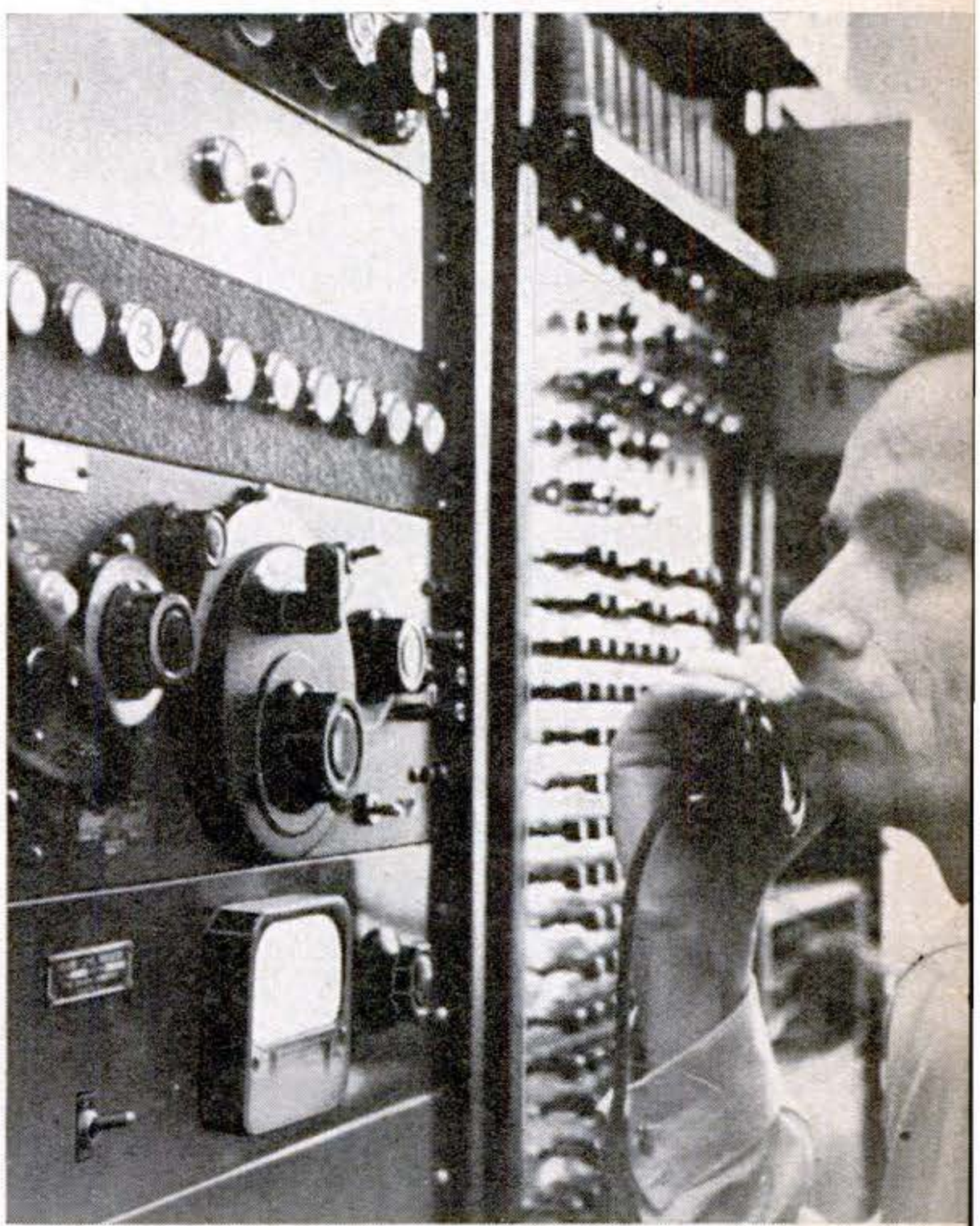
She's Learning Stage Tricks

WHERE should an actor stand on stage to get most attention?

Psychologists at Cornell, using a tiny stage with footlights, overhead lighting and dark mannikins (right) have bolstered the old tradition that center stage is THE spot. But study proved in general that a star's isolation from competition and from walls and corners is more important than position on stage.

She's Running a Railroad

MARGUERITE COOK kept right on working this traffic control board while it was moved—without being disconnected—out of an old building, across three tracks and into a new building. During the 1½-hour moving job, Miss Cook handled switches and signals to pass four Pennsy trains through the Terre Haute territory.



He's Talking to a Signboard

SOME day you, too, may talk to "Audrey"—the automatic digit recognizer—to get a phone number. It sorts out spoken numbers from zero to nine, responds by flashing an appropriate light. Not yet in a state to tolerate voice variations or careless enunciations and accents, it may eventually control dialing mechanisms, Bell Labs hopes.

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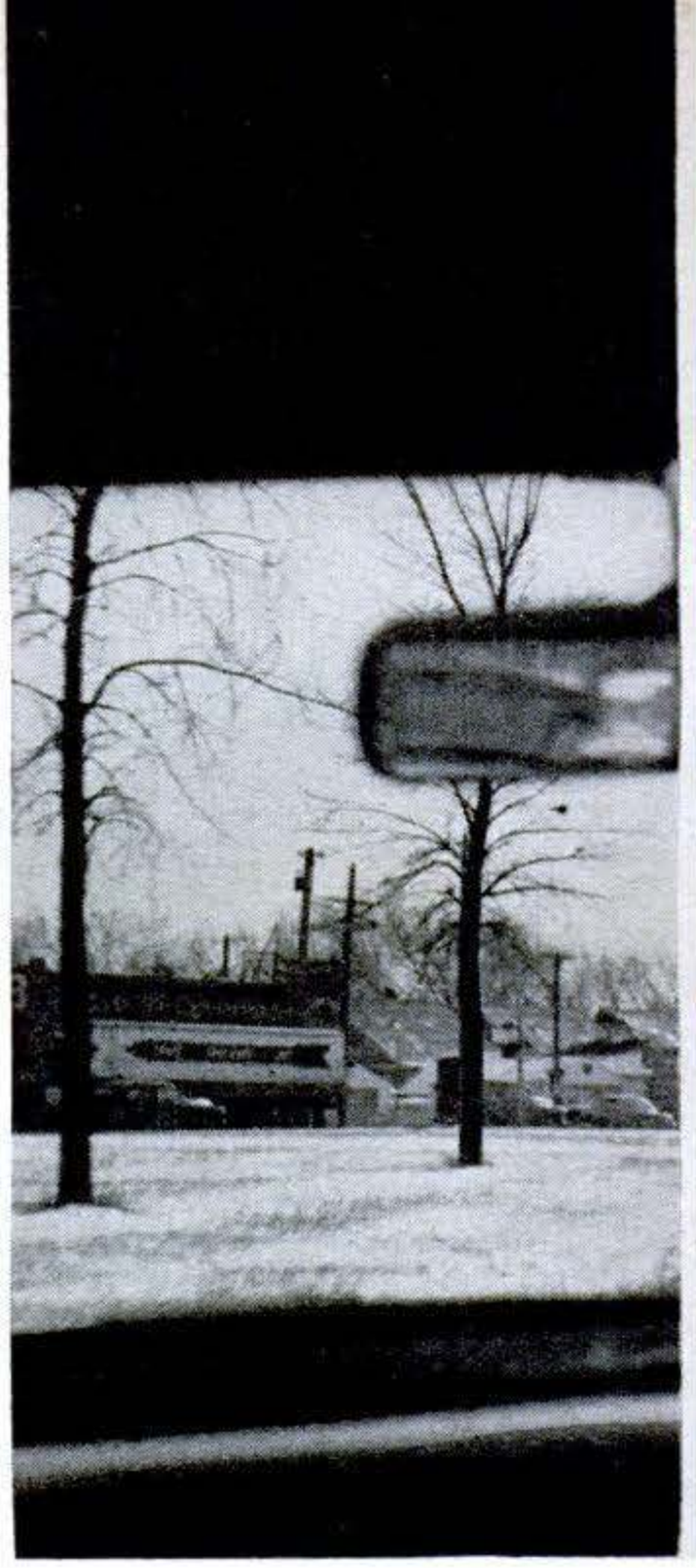
WILBUR SHAW REPORTS
FROM THE DRIVER'S SEAT OF

America's Most Powerful Car



TWELVE SECONDS after taking off abreast of the 1952 Cadillac the photographer was riding in, the 1953 Cadillac I was driving (arrow) was hitting 60 and leaving the other car well behind.

KICKING up its heels in celebration of its 51st birthday, Cadillac has nosed out its closest rival in the horsepower race among big mass-production automobiles.

Cadillac started the race, was left behind for a while and now once more is out in front. The 1953 Cadillac has a 210-horsepower engine. That's five horsepower more than the new Lincoln has (PSM, Jan. '53, p. 110), 30 more than the 1953 Chrysler produces.

Smart Engineering Pays a 20-Hp. Bonus

But, strange as it may seem to you, Cadillac isn't doing much boasting about that power. What its engineers really are proud of is that they have coaxed more fuel economy, efficiency and smoothness out of their spirited high-compression engine. The added zing—20 horsepower more than the 1952 Cadillac had—nice as it is to have available, is really a by-product, they say.

Still, if you want a race-horse start and acceleration like a plane's take-off, the '53 Cadillac has them. With a four-passenger load, it will spurt from a standing start to 60 miles an hour in 12.2 seconds and will hit 80 in 20.8 seconds. The 1952 car took 13.1 seconds to reach 60 from a standstill, 24.2 seconds to get up to the 80-mile-an-hour point.

They've Done Quite a Bit to This Car

The car that Cadillac put out in 1903 is a model-makers' favorite, sold in kit form now. Will 1953's most powerful car seem equally charming on a mantle in 2003?

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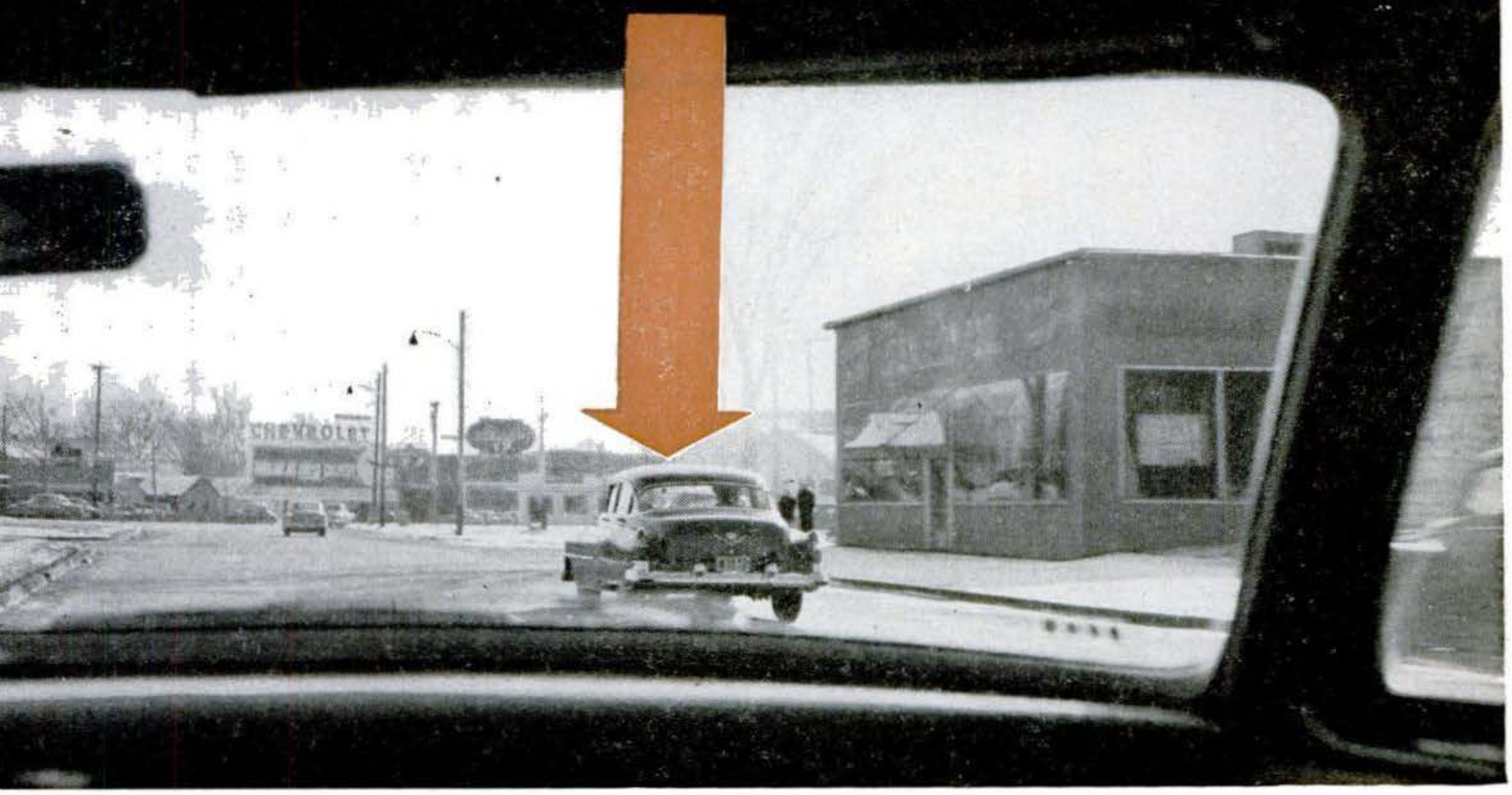
Pepped up by a 210-horsepower engine—that still runs soft and saves gas—the new Cadillac spurts ahead of its rivals.



The engineers preferred to talk to me about gas mileage, however—16.2 miles to the gallon in average city driving, 18.2 on the open road. That is 1½ to 2½ miles per gallon better than the 1952 Cadillac could do.

For an engine as powerful as this one and a car as big and heavy, those are impressive figures.

I must say, though, that I've often wondered why there's so much fuss about fuel economy in passenger cars. The difference between getting 15 miles to the gallon and 25 would cost the average driver less than $50 a year. You'd think the added comfort and pleasure of a bigger, more powerful car would more than offset its tendency to drink up more gasoline.

'53 Engine Takes Life Easier

To gain economy, Cadillac engine experts first lowered the rear-axle ratio from 3.36 to 3.07 to 1. This means that the engine doesn't have to do as much work per mile. The fewer r.p.m. required, the slower the pistons, valves and all moving parts need travel. In other words, less engine friction is created. And the less friction there is, the less horsepower is lost by that route. There's where your economy comes in.

A drop in r.p.m. naturally also brings a drop in engine noise and vibration.

But economy and quiet are all you would gain from the lowering of the rear-axle ratio if you didn't have some compensating gain in propelling force, or torque. You'd immediately notice that the car had become sluggish.

The easiest way to restore drive to the engine would have been to increase the piston displacement, but that's the most expensive way to do it in terms of fuel cost.

Cadillac engineers retained the economy they had gained by lowering the rear-axle ratio and at the same time increased the torque produced by their engine, in these ways:

- Changing the shape of the combustion chamber to promote more even burning of the mixture of gasoline and air.
- Lowering the spark plugs, for better flame propagation.
- Reducing the quench, or "squish," area in the cylinder.
- Changing the valve timing and in-

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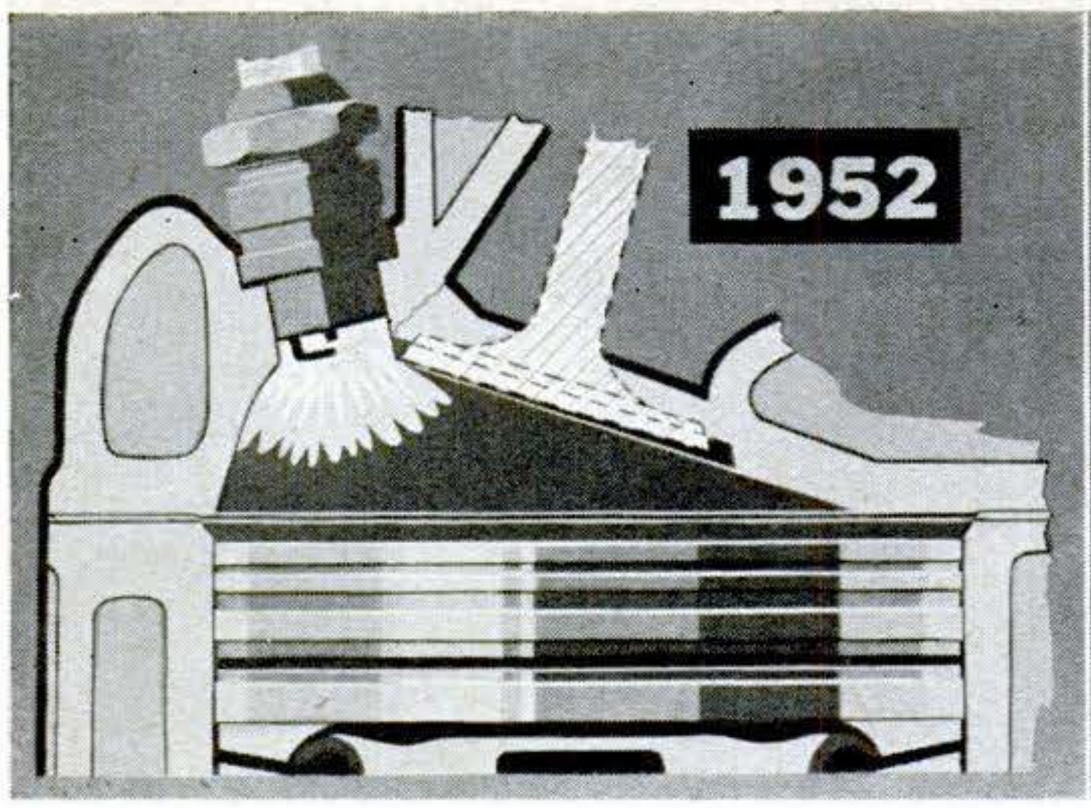

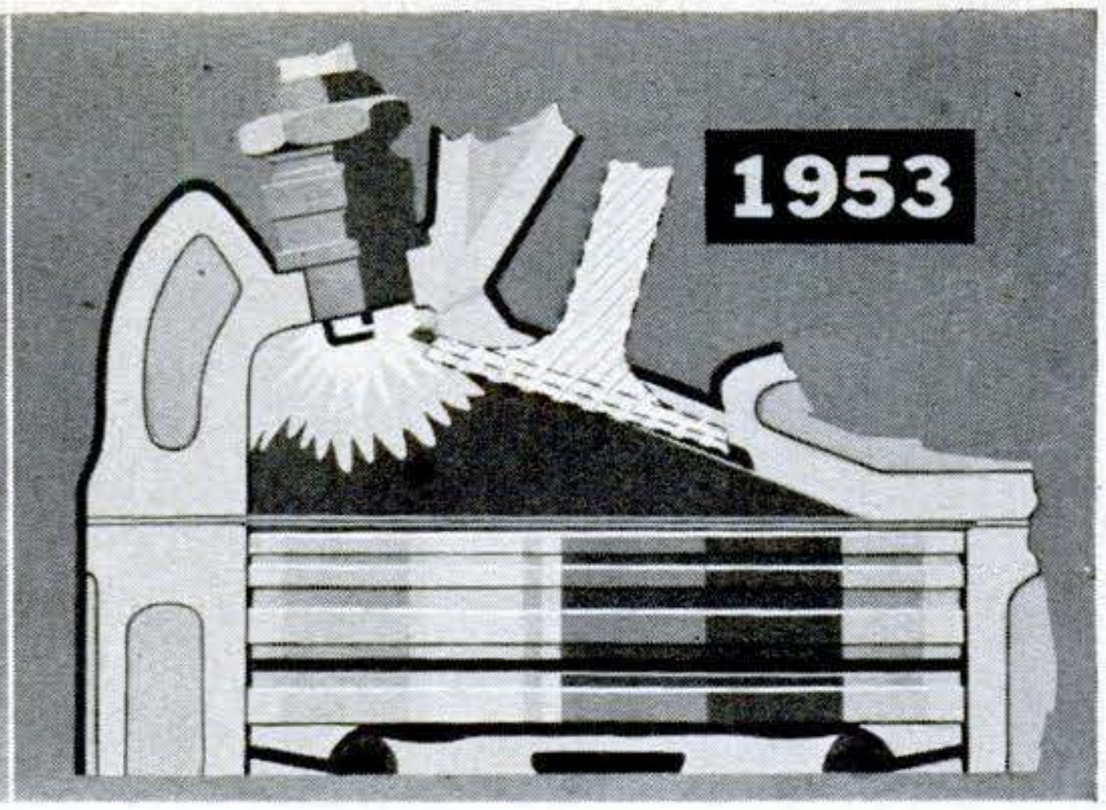

SEAT OF POWER is the engine combustion chamber. These comparative drawings of the 1952 and 1953 Cadillac combustion chambers show how the contours have been altered and the spark plugs lowered to speed up progressive burning of the fuel-air mixture.

creasing the lift of the valves to enable the engine to breathe deeper.

- Improving the distributor to give a faster response to changes in engine speed.
- Altering the carburetion to provide generally leaner mixtures, though rich enough to avoid ping.

Luxury Is the Keynote

You expect quality features in a Cadillac, and in the 1953 lines they are evident everywhere, from the firm, heavy click of the doors to the push-button radio aerial and window lifts.

Air conditioning, capable of lowering interior temperatures from above 100° to 75° in a few minutes, is available at extra cost. For winter driving there are heaters for the passengers in back as well as those in front.

Power steering is obtainable, too, of course, and it has been improved in the 1953 cars. Cadillac still hangs back from full power steering, however, with the excuse that it is unsafe. I don't agree with that attitude, and I am sure that Cadillac, perhaps under pressure from its buyers, will eventually come around to my point of view.

The company offers the biggest tires available for passenger cars—8.20 by 15 super balloons—to all clients who choose the whitewall variety. This gives the cars bigger footprints to go with 12-inch brakes all around. The tires are mounted on any of five kinds of wheel, ranging from the standard ones, which

FACTS ON '53 CADILLAC

Model: Series 62 4-door sedan.

Engine: V-8 overhead valve; 210 hp. at 4,150 r.p.m.; compression ratio, 8.25:1; piston displacement, 331 cu. in.; piston travel (in feet per car mile at 20 m.p.h.), 1,328; bore and stroke, 3.81" by 3.63"; torque, 330 lb.-ft. at 2,700 r.p.m.

Weight: 4,372 lb.; per hp., 20.82 lb.

Transmission: Hydra-Matic; rear-axle ratio, 3.07:1.

Steering ratio: 25.47:1; radius of turning circle, 21.6'.

Effective brake-lining area: 258.5 sq. in.

Springs: front, coil; rear, semi-elliptic.

Outside dimensions: height, 62.7"; overall length with bumpers and guards, 215.8"; width, 80.1"; wheelbase, 126"; overhang, front 34.9", rear 54.9"; tread, front 59.12", rear 63.10".

Inside dimensions: seat-cushion width, front 63.7", rear 64.3"; leg room, front 43.9", rear 43.6"; headroom, front 35.8", rear 35.6"; seat height, front 14.6", rear 12.5"; vertical distance, steering wheel to seat cushion, with seat in rear position, 5.1"; front-seat adjustment, horizontal 4", vertical, .6".

Tire size: 8.00 by 15 super balloon (black sidewall), 8.20 by 15 super balloon optional (white sidewall).

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don't cost the buyer anything extra, to chrome wire wheels, which do.

The sound level of the new Cadillac is, I'm sure, lower than that of any other car in America. It is now at a new low, partly because the engine is quieter and because there are resonators and mufflers on the twin exhausts, but largely because of added insulation.

Insulation Added

There's a glass-fiber blanket under the hood, for instance, enclosed in a sheath of black plastic so that it is hard to distinguish from the metal. There is insulation between the ceiling fabric and the roof, too, for half the distance to the rear window. They tried insulating the entire ceiling but an unnerving boom resulted. Half-insulation turned out to be best.

A safety feature worth mentioning is the new locking arrangement on the doors. With small children in mind, Cadillac body designers fixed it so that once the door is locked, you can't open it from inside by turning the handle. You have to pull up the locking plunger first.

Shifting Is Smooth as Silk

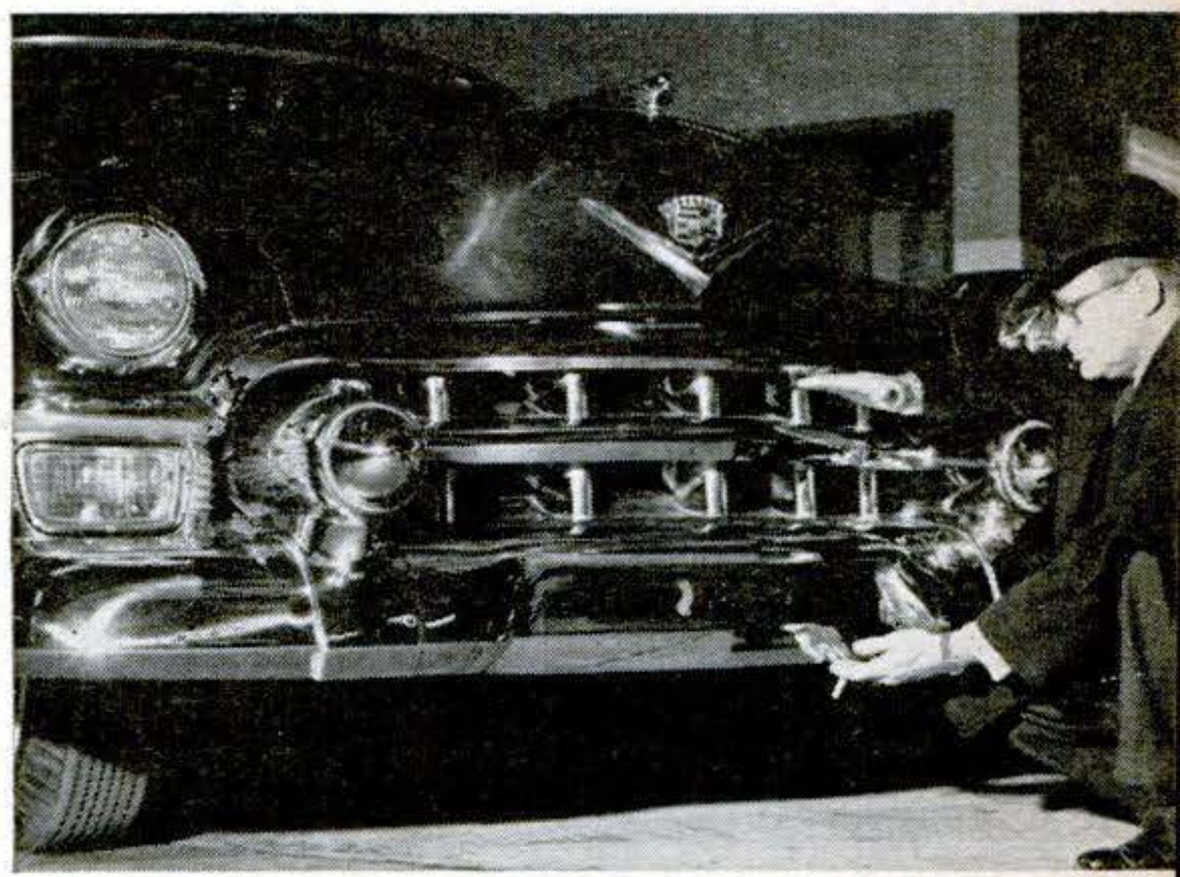
Automatic transmission and a 12-volt electrical system are now standard equipment on practically all Cadillacs. In keeping with a smoother engine, the Hydra-Matic transmission has been further refined. The shift points have been modified to conform better to throttle openings. As a result, gears shift so easily that there's no engine fuss and barely noticeable difference in "feel."

A rear-shelf speaker for the radio, located under the package shelf, is optional for all Cadillacs.

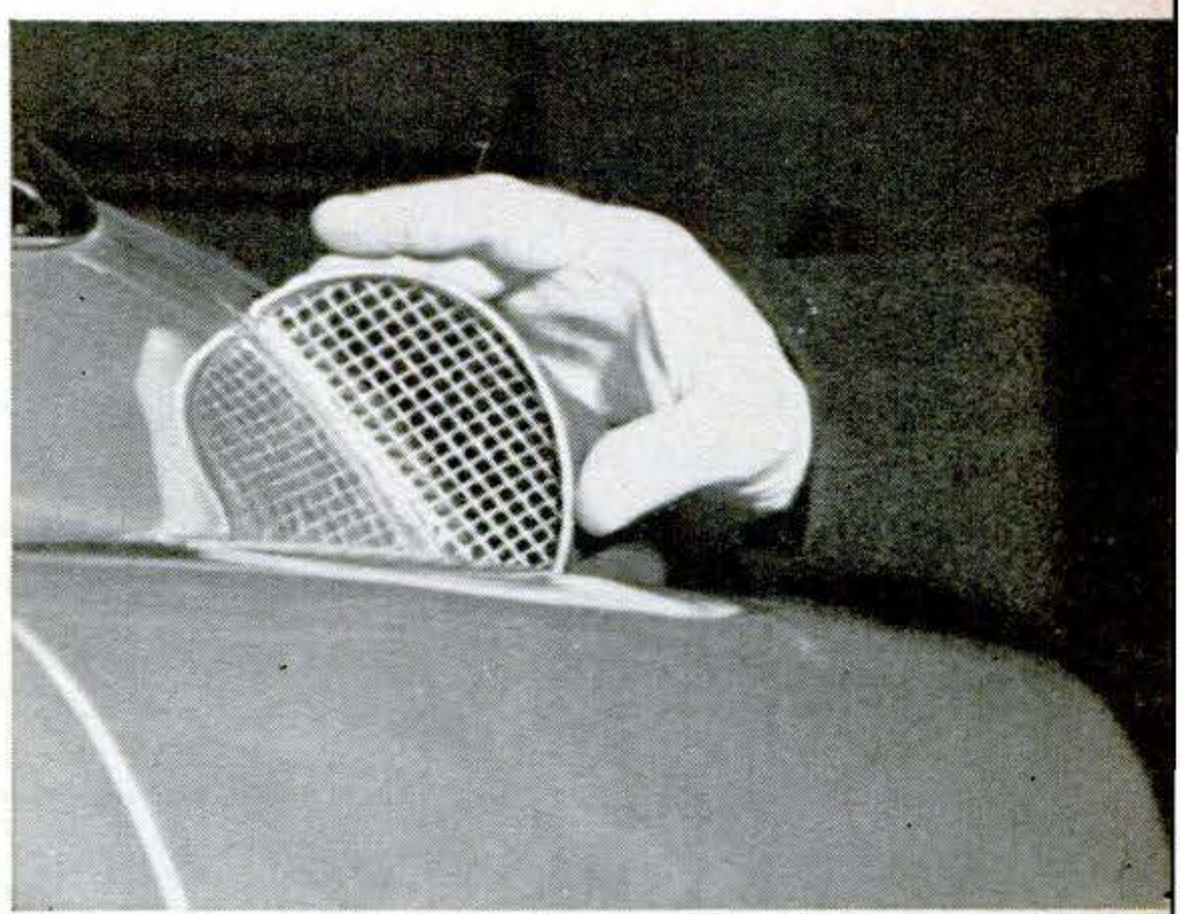
And in the eight-passenger limousine there is a duplicate set of radio controls in the rear seat that override those in front. If the chauffeur has tuned in bebop and the boss doesn't like it, a flick of the rear dial can force the poor guy at the wheel to listen to Beethoven. END

Next Month: Wilbur Shaw will Report from the Driver's Seat of the spruced-up 1953 Nash Rambler.

I LIKE THESE HAND GRIPS on the '53 Cadillac's steering wheel. They are of greenish roughened plastic. The grips on the El Dorado de luxe convertible are of leather.



THE MASSIVE BUMPER-GRILLE is attached in one piece on the assembly line. It is entirely separate from the front of the hood, to avoid crumpling sheet metal in slight collisions.



THIS AIR SCOOP on the rear fender has a twin on the other side of the car. They are the only outward signs that the 1953 Cadillac to which they are attached is air-conditioned.

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BING CROSBY holds piece of VTR tape on which 4,000,000 impulses are recorded.

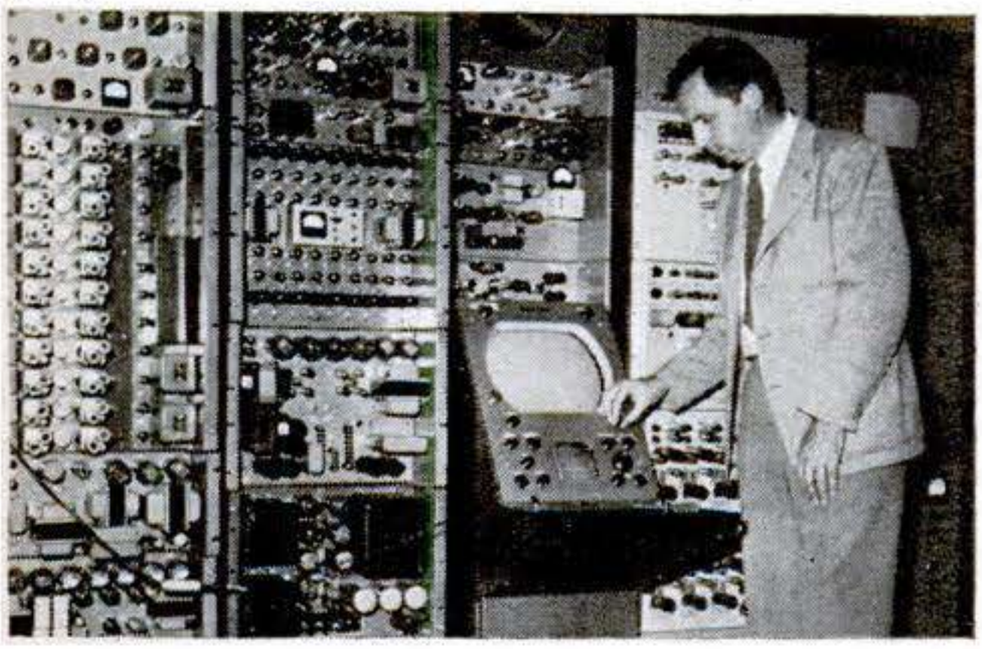
Tape Carries Both TV Pix and Sound

A DREAM of the television industry is closer to realization with the announcement of a system that records live shows, both pictures and sound, on tape. It is VTR—Video Tape Recording—a development of the Bing Crosby Enterprises.

Since VTR is all electronic and magnetic recording, the costly and time-consuming processing of film is eliminated. For you, that probably means bigger and better "canned" television shows.

The main problem has been licked—that of increasing by more than 200 times the amount of information tape can record. "We've got a good image plus a few bugs," says John T. Mullins, who conceived the system. He doesn't consider removing the bugs difficult.

TEST VTR SETUP puts programs on tape, plays them back to screen and speaker.



The Fish

Century's most important catch is a "missing link" bridging 300,000,000 years of life.

WHEN a native African fisherman hauled out of the Indian Ocean recently a strange five-foot fish, the news flew 'round the world.

As he was about to sell his catch, a friend recognized it as a fish for which Prof. J. L. B. Smith of Rhodes University, Grahamstown, was offering a reward. The professor was notified, flew up from South Africa, looked at the fish, identified it as a *coelacanth*, and wept with joy.

When Dr. Bobb Schaeffer, associate curator of fossil fishes at New York's American Museum of Natural History, heard the news he hailed the find as the most important event in the study of natural history in this century.

Why the ugly *coelacanth* (pronounced SEE-la-kanth) is so important is shown in the picture chart at the right.

The story goes back to a group of fish known as *crossopterygians* that lived some 300,000,000 years ago. There is evidence that descendants of this fish developed limblike fins which enabled them to crawl out of water. Thus, they were able to climb the ladder of evolution from reptiles to primitive mammals to primates.

Another branch of the same family, the *coelacanths*, had six stubby fins, two double sets that showed promise of becoming front and hind legs. But they didn't, and until recently the only evidence that these fish ever existed was from fossils—remains preserved in stone. They were supposed to have disappeared, like dinosaurs, 75,000,000 years ago.

Now a fisherman's luck has turned up a "prehistoric" fish that scientists can dissect for study of the internal organs, which are missing from fossils.

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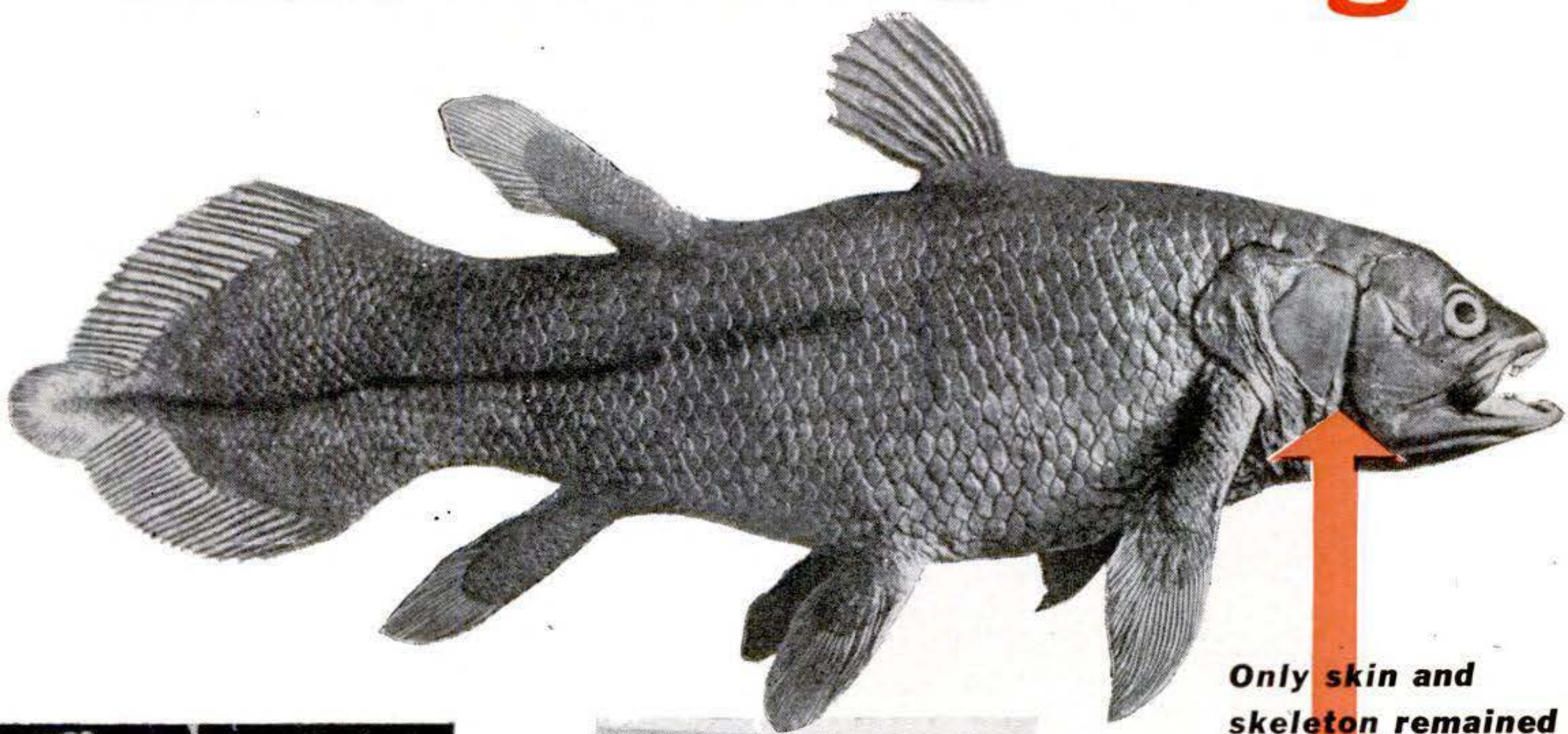
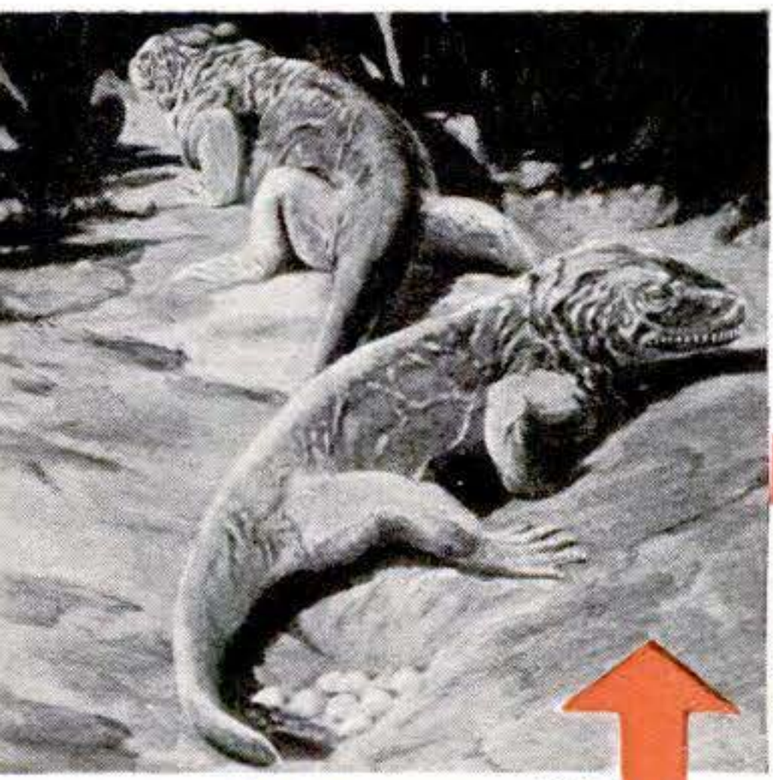
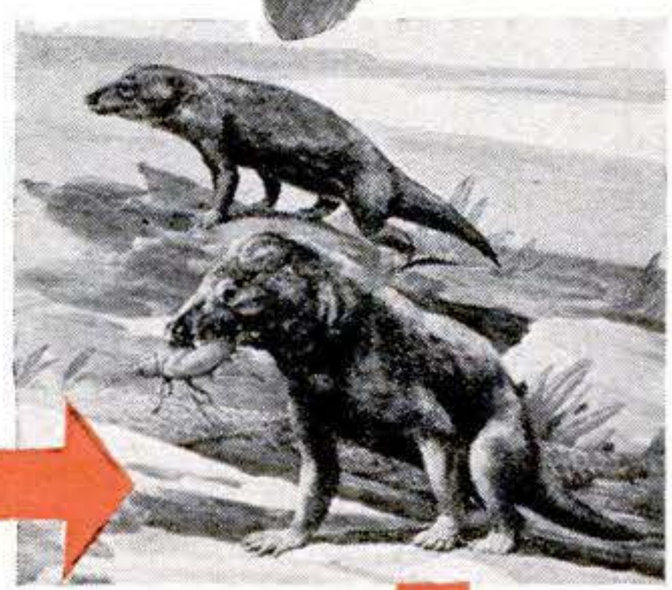
That Evolution Forgot



Only skin and skeleton remained of coelacanth (above) caught in 1938. New specimen has many internal organs intact.



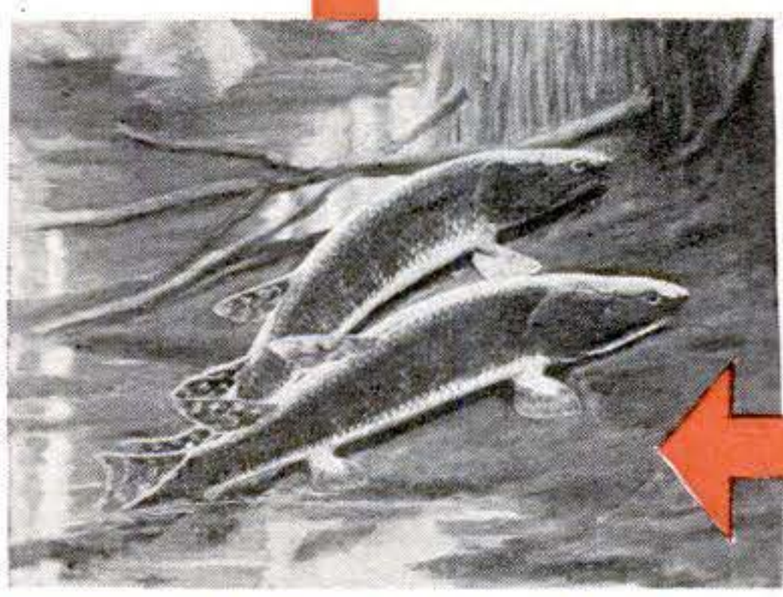
. . . became reptiles . . .



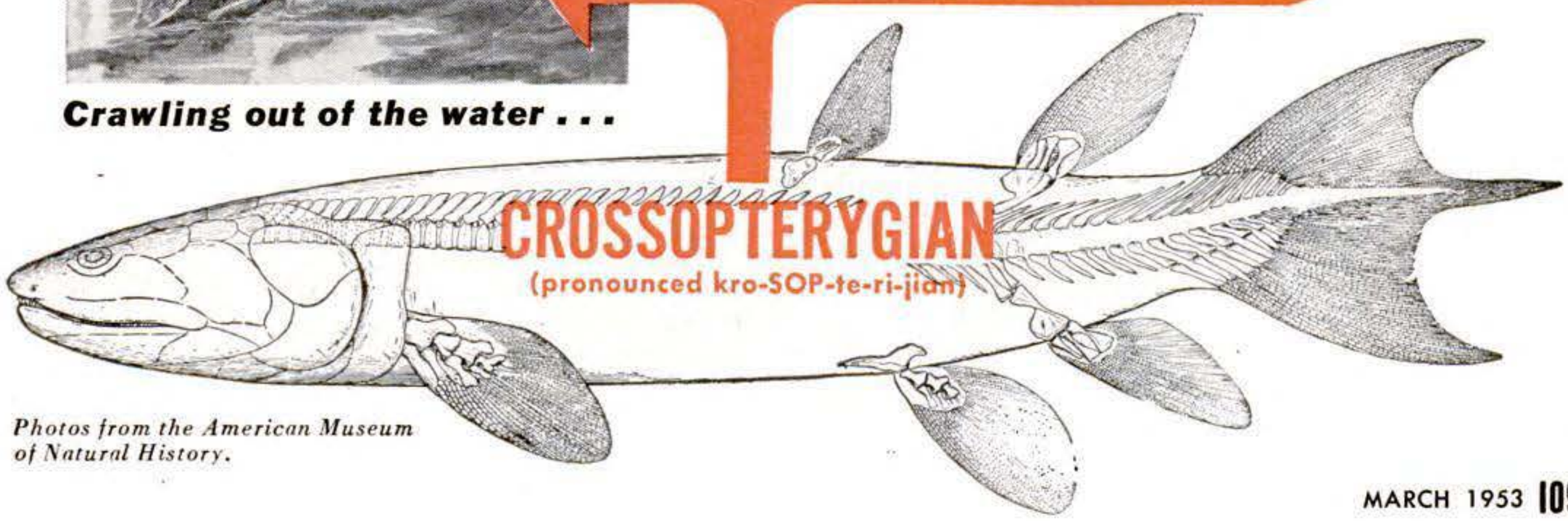
. . . then primitive mammals . . .

. . . and finally primates.

300,000,000 YEARS



Crawling out of the water . . .



Photos from the American Museum of Natural History.

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Control Tower on Wheels Talks Planes Down to Runway

THEY send the control tower out to meet the planes at Goodfellow Air Force Base, Tex. It's on a truck. The "tower" itself, complete with three radio transmitters and receivers, has retractable wheels so that it can be rolled off the truck. The unit was designed by Lt. Col. Savell Sharp mainly to land training planes, and is reported to be much easier to maintain than mobile towers mounted in separate trailers.

Plastic Box Shows Your Mail

YOU can not only tell that you have mail, but even who it's from with a new plastic mailbox. The bottom slants to slide letters forward for better visibility. There's a thermometer on the box, too. Campro Sales Co., 1300 14th St. S.W., Canton, Ohio, sells it.

Two-Bowl Pipe—One's a Filter

THERE are two bowls to stoke up on this pipe, but only one burns. Tobacco in the second serves as an easily replaceable filter to cool and dry the smoke. Sepra-Bol is made by International Allied Industries, Box 202, Hialeah, Fla.

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THE ENTERPRISE, "a Rolls-Royce on two wheels," has never been opened up. Its owner considers 65 miles an hour fast enough.

His Dream Motorcycle Cost $5,000

FRONT WHEEL TURNS EASILY within the streamlined panels formed of car-body steel. Louvers admit air to cool the 45-cu.-in. Indian Scout engine. Safety tubing forms a framework to protect the running gear in a crash. Tires are 6.00 by 9.

Streamlined panels of auto-body steel hide the frame and engine while a new principle of springing gives a bump-free ride.

By Andrew R. Boone

ONE night in March, 1950, O. Ray Courtney worked until two a.m. and drove home discouraged. He was trying to design a better motorcycle. He wanted one with the seat forward, with better cooling, better springing, and a more beautiful body. Discarded sketches littered the floor of his shop.

That night in a dream he saw a streamlined beauty skim across a flowered field. Too excited to report for work the next day, he hastily put his dream on paper—and he is riding that dream cycle now through the streets of Pontiac, Mich.

Courtney is a 56-year-old metalworker. As a boy in Dunkirk, Ind., he rode a one-cylinder 1911 Indian, moved on to an Excelsior twin, and did a little hill climbing and road racing. "The vibration," he still recalls, "was so tough I often couldn't keep my feet on the controls."

In the Air Corps during World War I, he began to gather ideas for streamlin-

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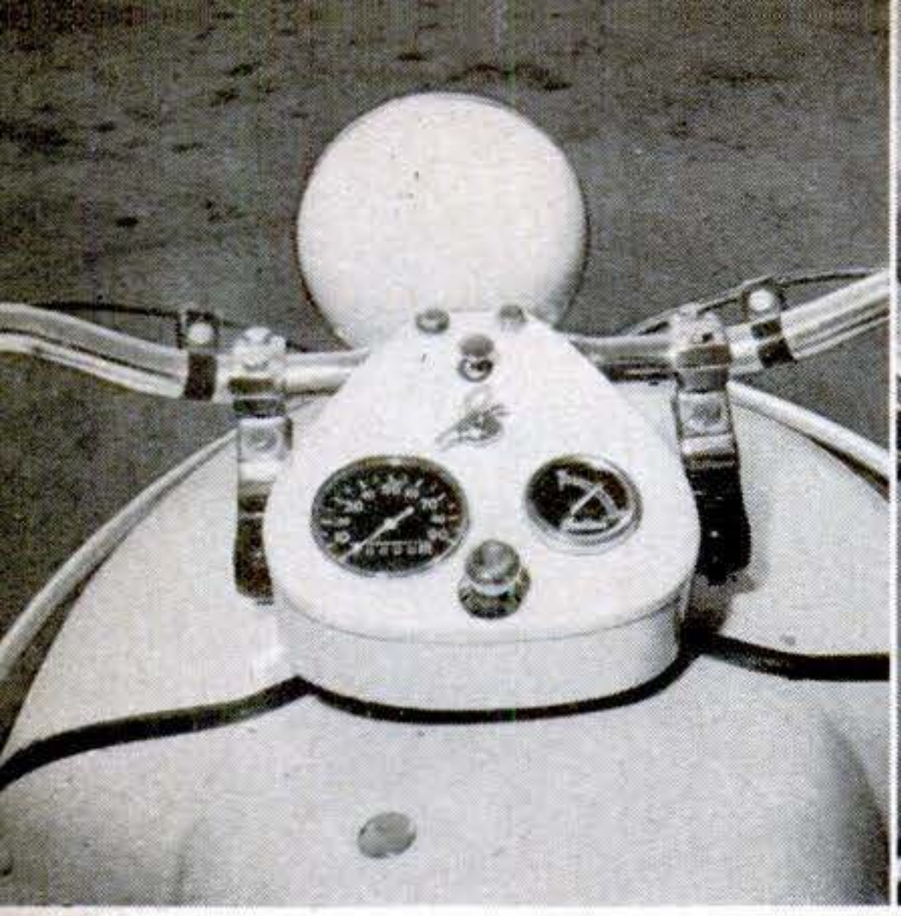
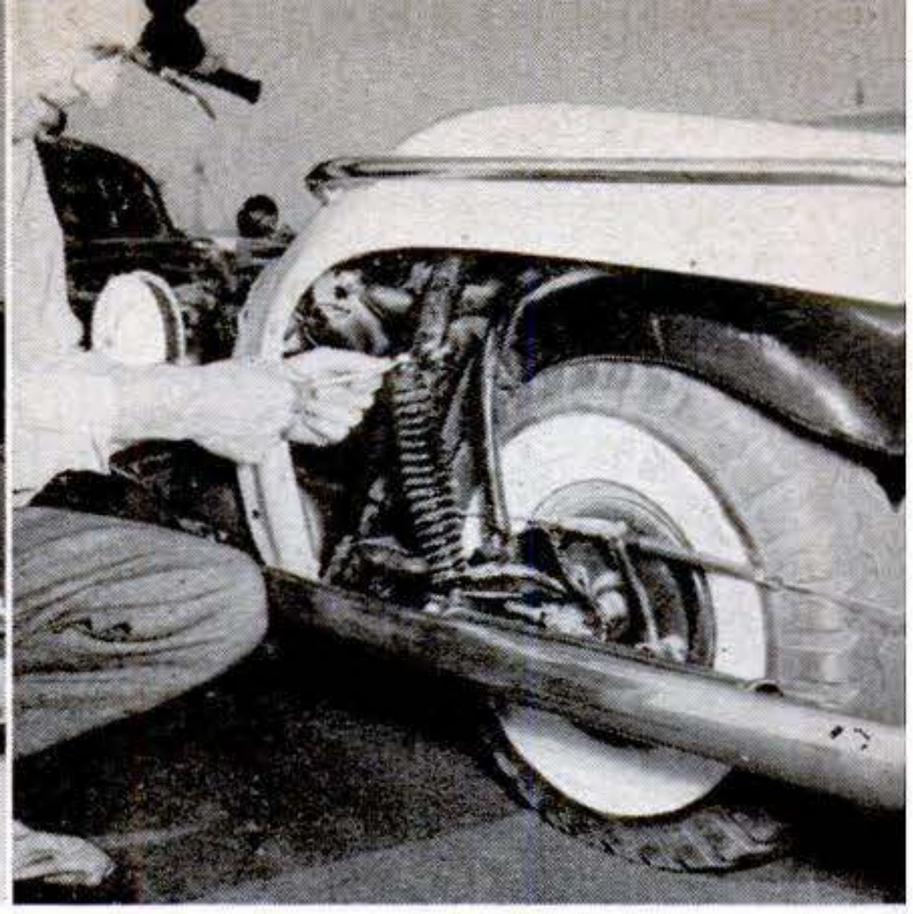


INSTRUMENTS are housed in neat island between handle bars. Mounted on island are speedometer and ammeter with lock positioned near front. Ride-control knob (not shown) is behind island.

SPECIAL GAS TANK, baffled to prevent splash, is located over front wheel. Bolted to top panel, it holds three gallons. A standard, one-gallon Indian oil tank is located at the rear of the engine.



INSIDE FENDERS mounted over wheels help prevent mud from building up on body panels. Steel strips along sides cover twin tailpipes and mufflers. Rear-wheel assembly is shown in the photo above.

ing. Years later he designed a streamlined car that became the '33 Olds.

Nowadays he designs body parts for Kaiser-Frazer. But he and his son Bill have a shop of their own where he works in his spare time. It took him two years of spare time to build the Enterprise.

This plush bike gives you a softer, springier ride than you'll get on any other motorcycle. You sit comfortably ahead of the rear wheel in a seat roomy enough for two, 10 inches farther forward than the saddles on most cycles.

The Enterprise steers like a car. The handle bars have been moved forward; the engine has 7⅛ inches of ground clearance (more than average), but the seat and body have been lowered, bringing down the center of gravity three inches for good cornering.

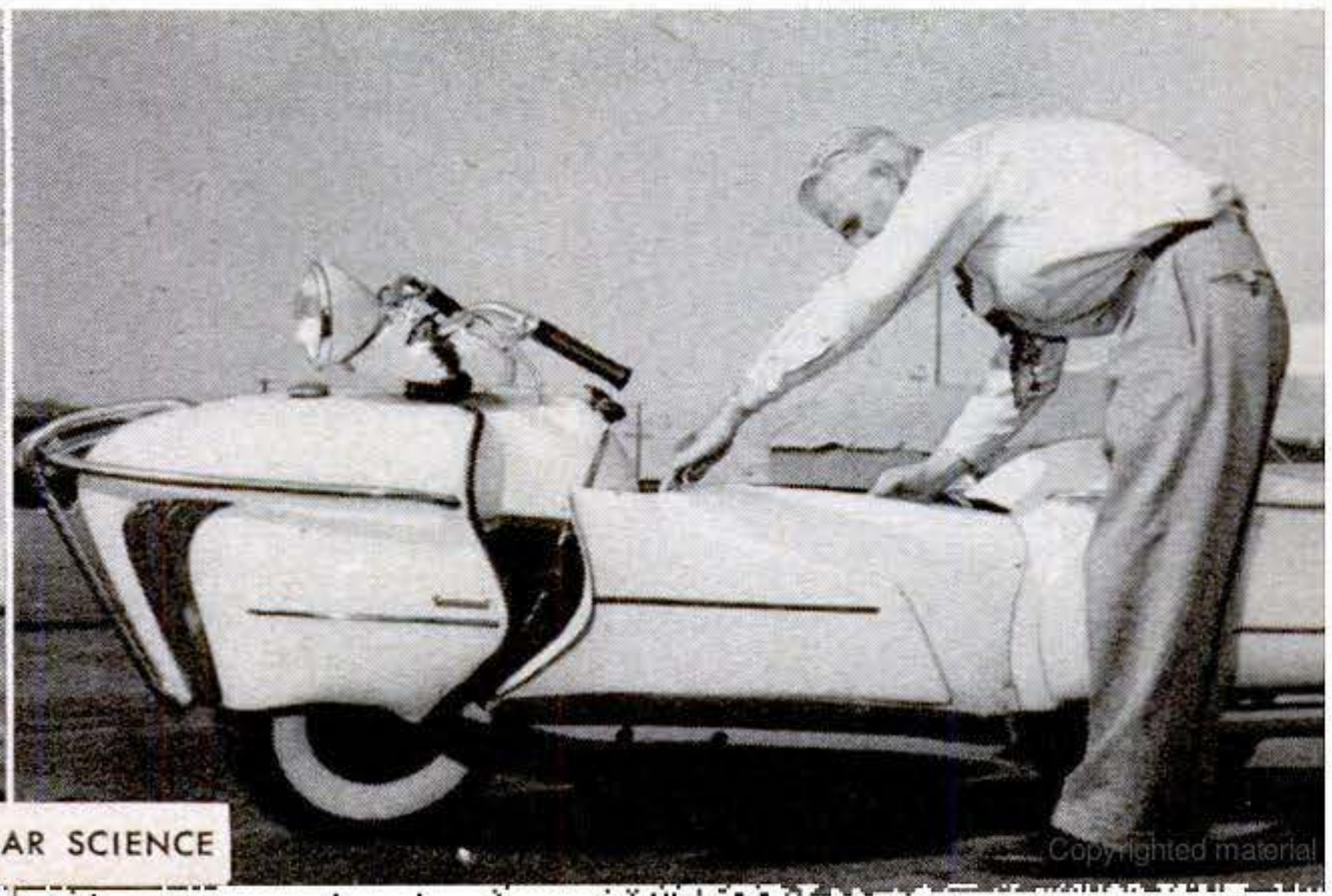
You advance the spark with your left hand, feed gas with your right. (Harley and some British bikes are driven similarly.) And you shift three standard gears. Either the left grip or the left foot operates the clutch. Your right hand powers the front-wheel brake and your right foot the rear brake.

Courtney built his first motorcycle in 1936. The front of this black-and-red job —it is still ready to ride—is strikingly like the first rounded Oldsmobile front fenders.

The white "dream" job that he is riding now cost him $5,000, but people say when it rolls by, "Hey, that looks like a Rolls-Royce on two wheels." He hopes to build more cycles. And they will sell for much, much less than the original Enterprise cost to make.

QUICK-RELEASE FASTENERS hold all panels to frame except the two main top ones which are bolted in place. The panels are 19-gauge car-body steel, shaped with a power hammer.

To reach oil tank, seat is snapped out of frame. Ride dampener steadies front wheel at high speeds. The 21-inch wheels, smaller than usual, permit sharp turns.



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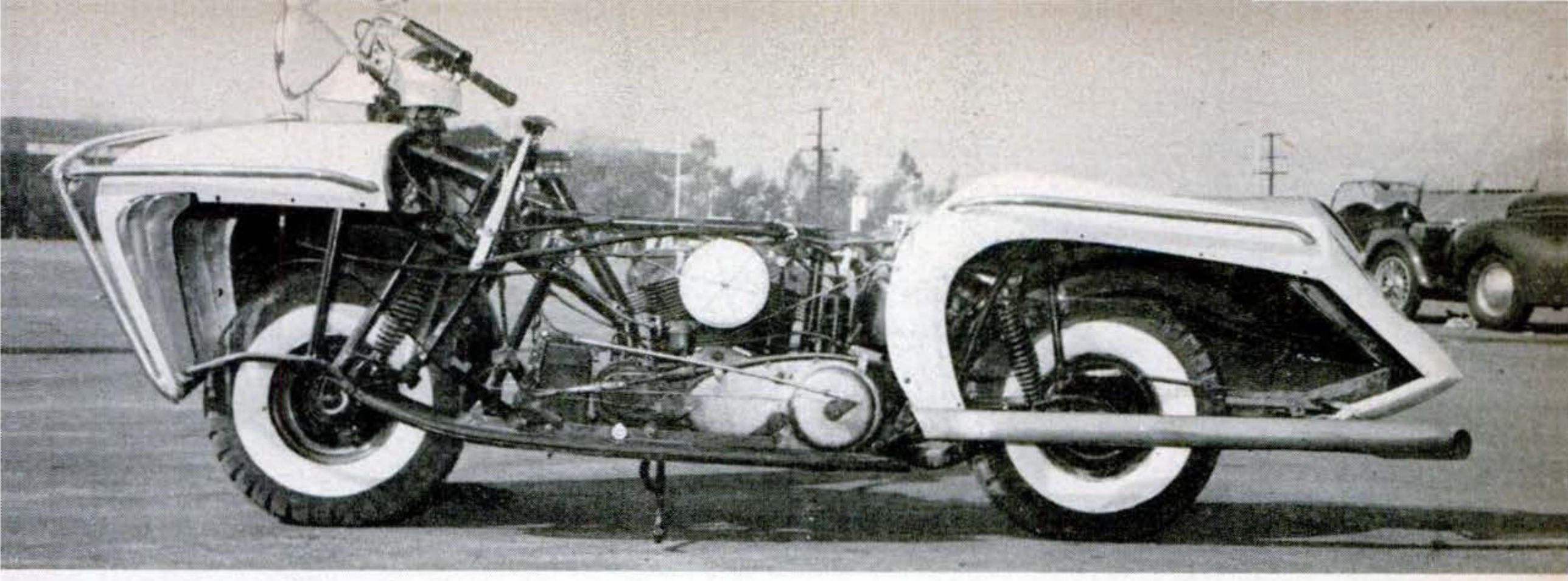
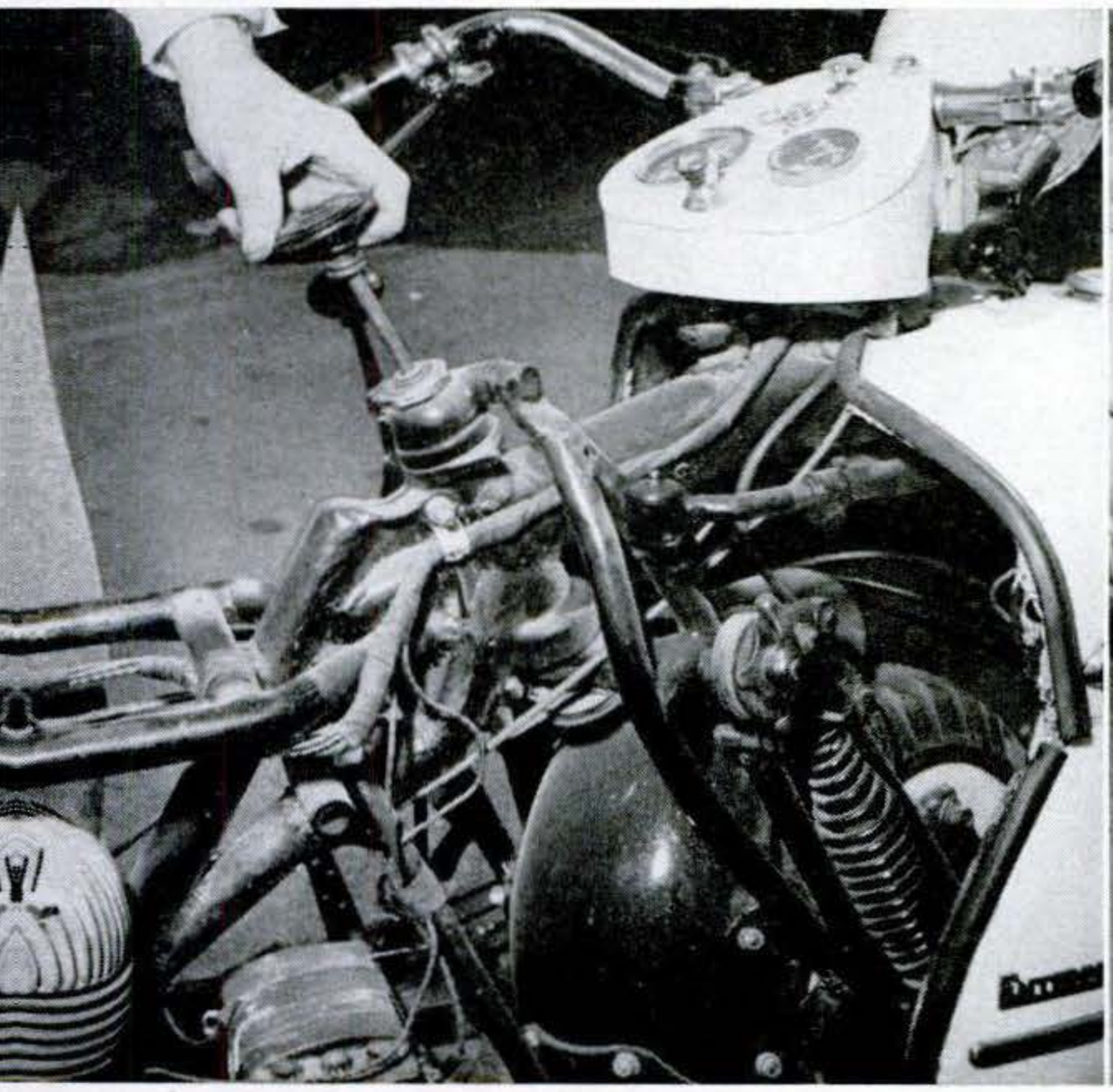


FRAME is 1⅛-inch chrome-steel tubing. Handle bars, 10½ inches forward on an extension tube, are mounted on a second head. They connect through drag links to fork.



EACH WHEEL is straddled by a U-shaped yoke to which is connected a pair of coil springs. All springs are controlled by Indian-type snubbers. Front wheel is shown here.

STREAMLINING continues to tail. Machine is 26 inches wide. Bulges flanking sides of rear wheel are metal-covered saddlebags. Twin exhausts feed out through twin tailpipes.

ROOMY SEAT snaps into place in the frame. Seat, 30 inches long, is made of foam rubber and mounted on tubing. Leather covering over rubber is an off white color.

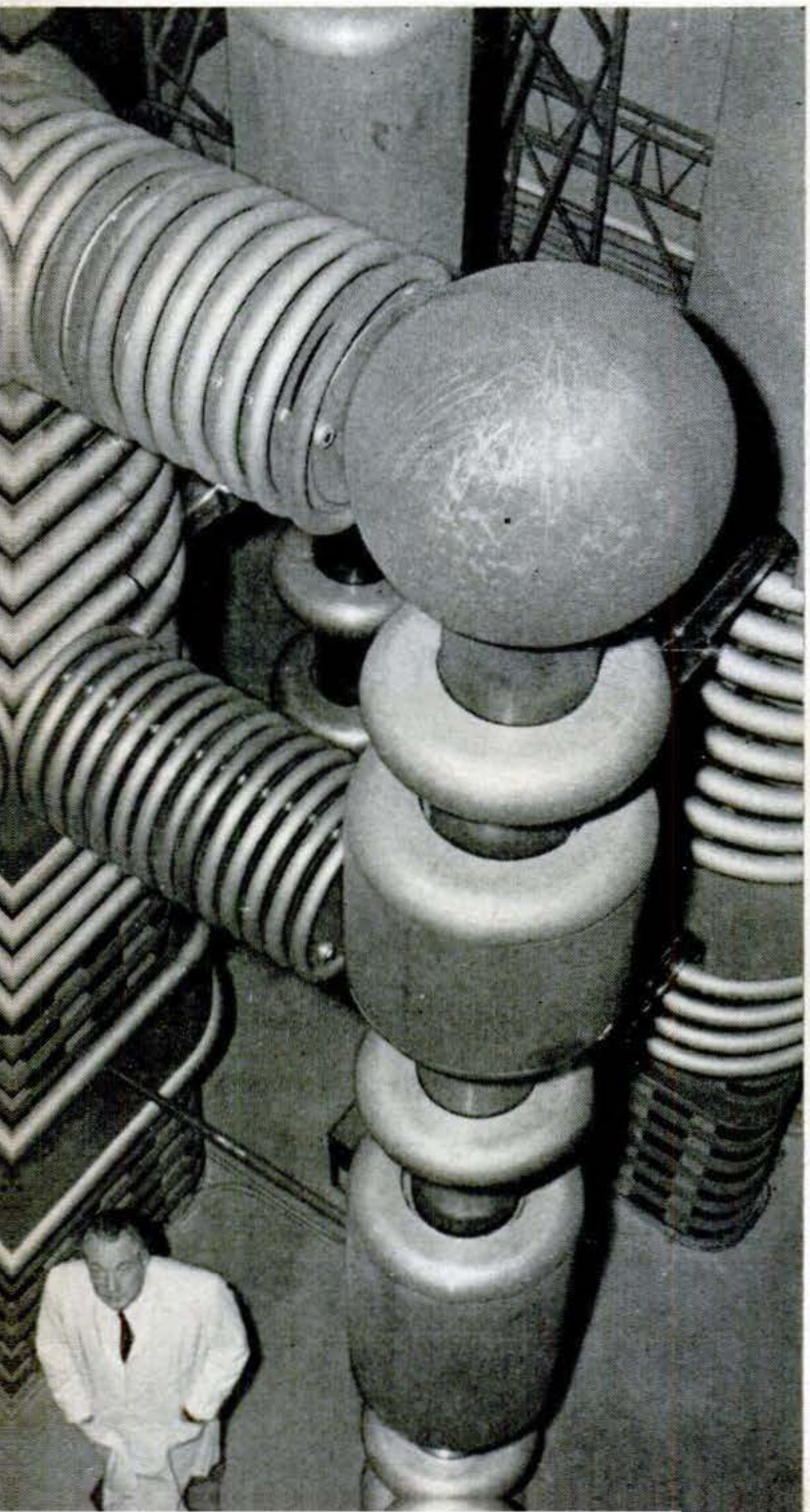
TWO CAN RIDE as comfortably as one on the big seat. Long footboards add to comfort and prevent splashing. The Enterprise is 112 inches long, weighs 580 pounds. END

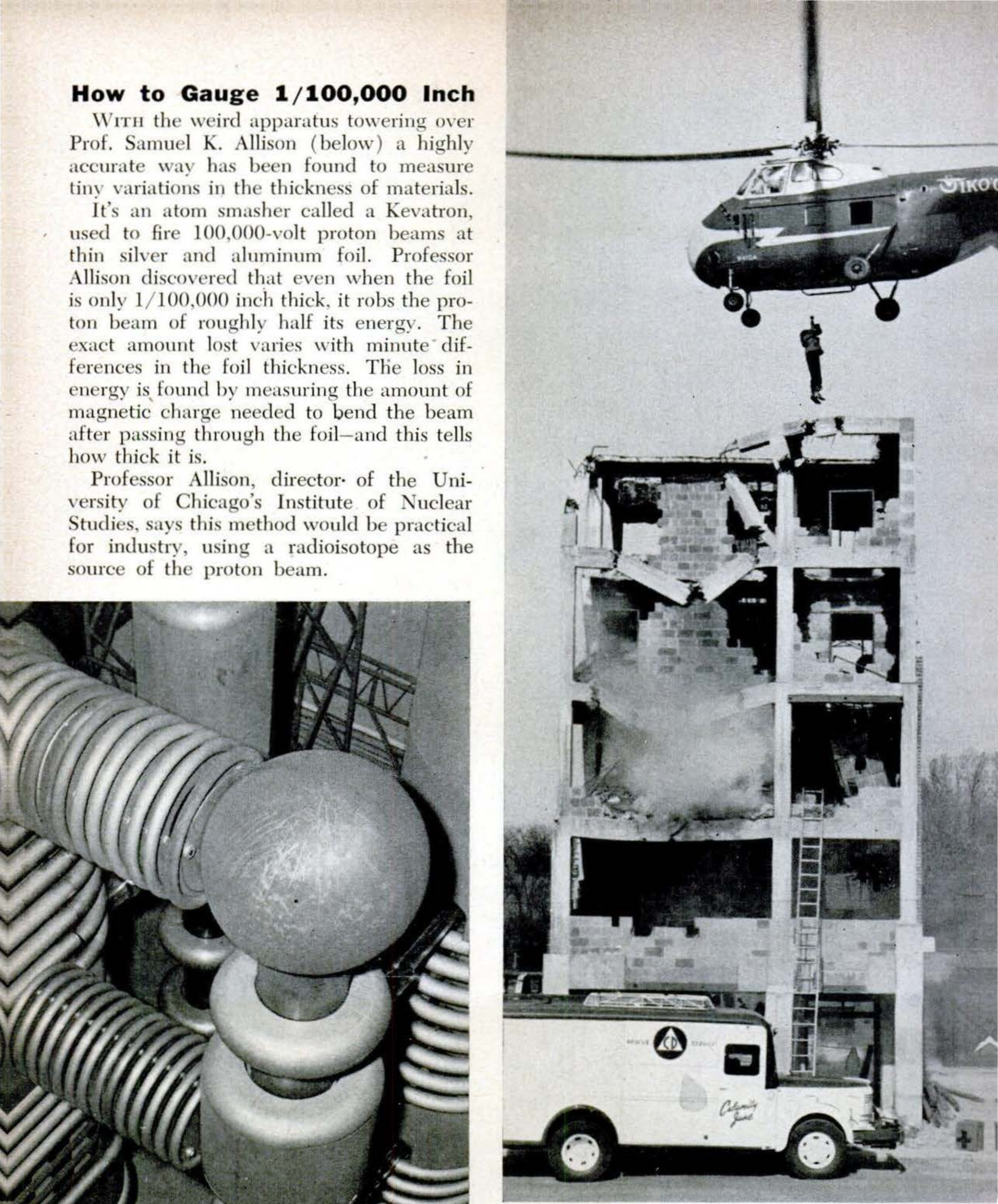
How to Gauge 1/100,000 Inch

WITH the weird apparatus towering over Prof. Samuel K. Allison (below) a highly accurate way has been found to measure tiny variations in the thickness of materials.

It's an atom smasher called a Kevatron, used to fire 100,000-volt proton beams at thin silver and aluminum foil. Professor Allison discovered that even when the foil is only 1/100,000 inch thick, it robs the proton beam of roughly half its energy. The exact amount lost varies with minute differences in the foil thickness. The loss in energy is found by measuring the amount of magnetic charge needed to bend the beam after passing through the foil—and this tells how thick it is.

Professor Allison, director of the University of Chicago's Institute of Nuclear Studies, says this method would be practical for industry, using a radioisotope as the source of the proton beam.





'Copter Enacts Rescue Role

LOWERING a rescue worker to the roof of a "bombed-out" building, a Sikorsky S-55 helicopter shows how it could help after an atom bomb hit. The scene is a simulated bomb-wrecked area at the Federal Civil Defense Training Center, Olney, Md.

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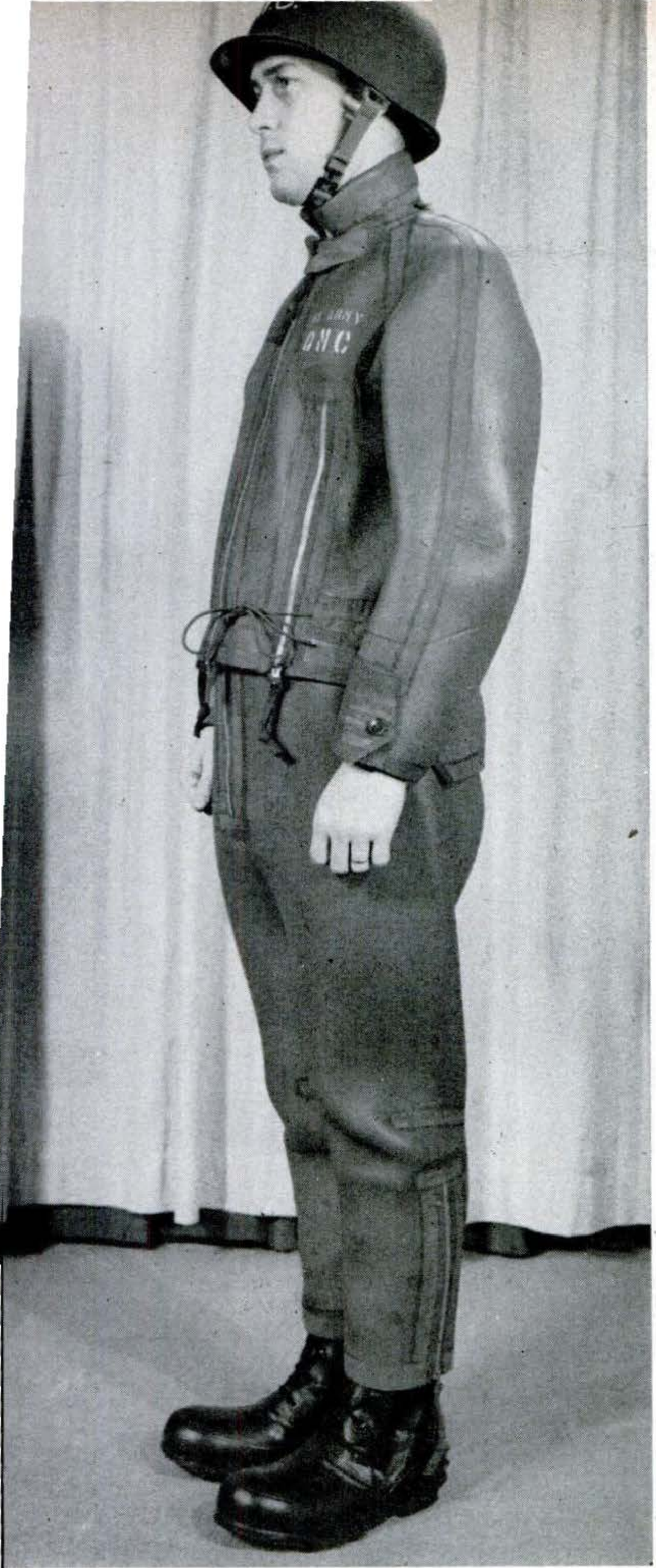
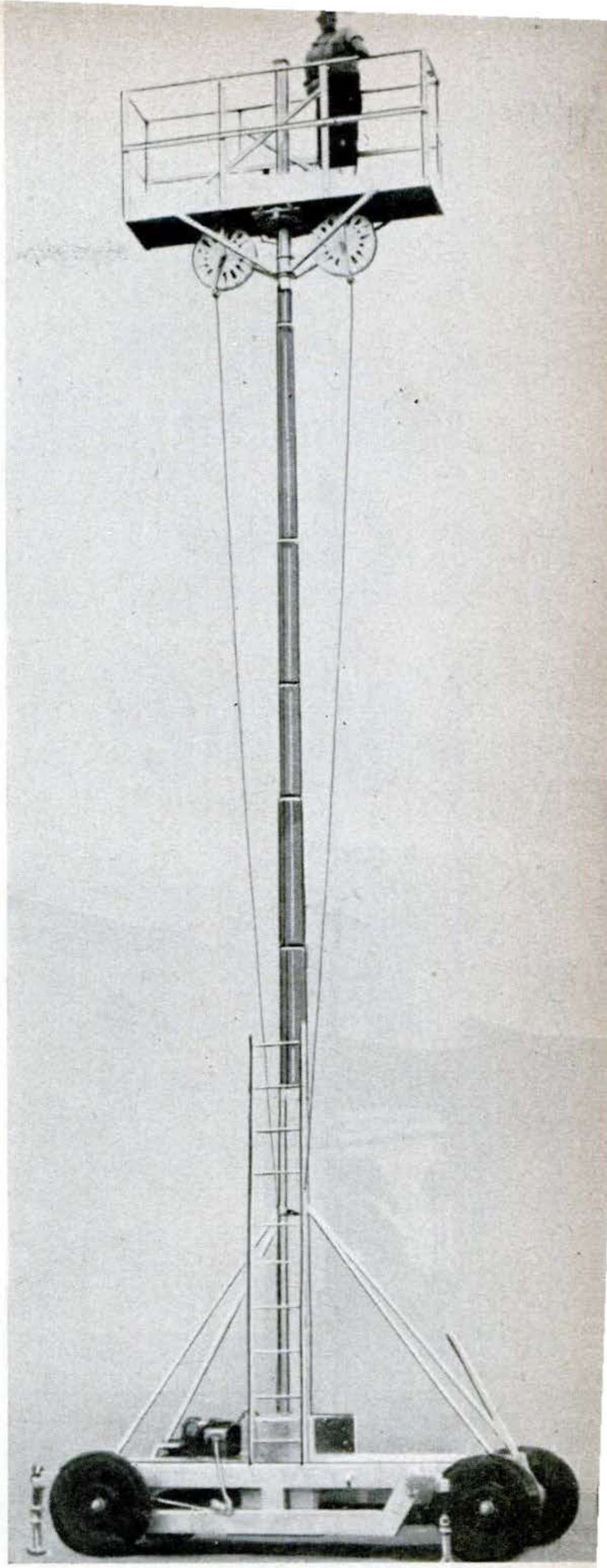


GIs Get Plastic Longjohns

BELIEVE it or not, this is underwear—the kind that GIs wore in Korea this winter. It is made of plastic resembling sponge rubber, filled with tiny cells that keep you warm even with a wet skin—and afloat, too. Cotton jacket and overalls are worn over it.



Lifts Three Tons Four Stories

THIS hydraulic lift and jack can hoist a maintenance crew 38 feet in the air—and carry a 6,000-pound load while doing it. Made by Hamlin-Klock Corp., of Pasadena, Calif., it is powered by a 7½-hp. motor that drives hydraulic columns.

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Are Rear-Engine Cars Coming?

REAR-ENGINE "CENTAUR" built by John Palermo at a cost of $2,200 made a hit at the World Motor Sports Show in New York last month. Powered by a 1942 Ford four-cylin-

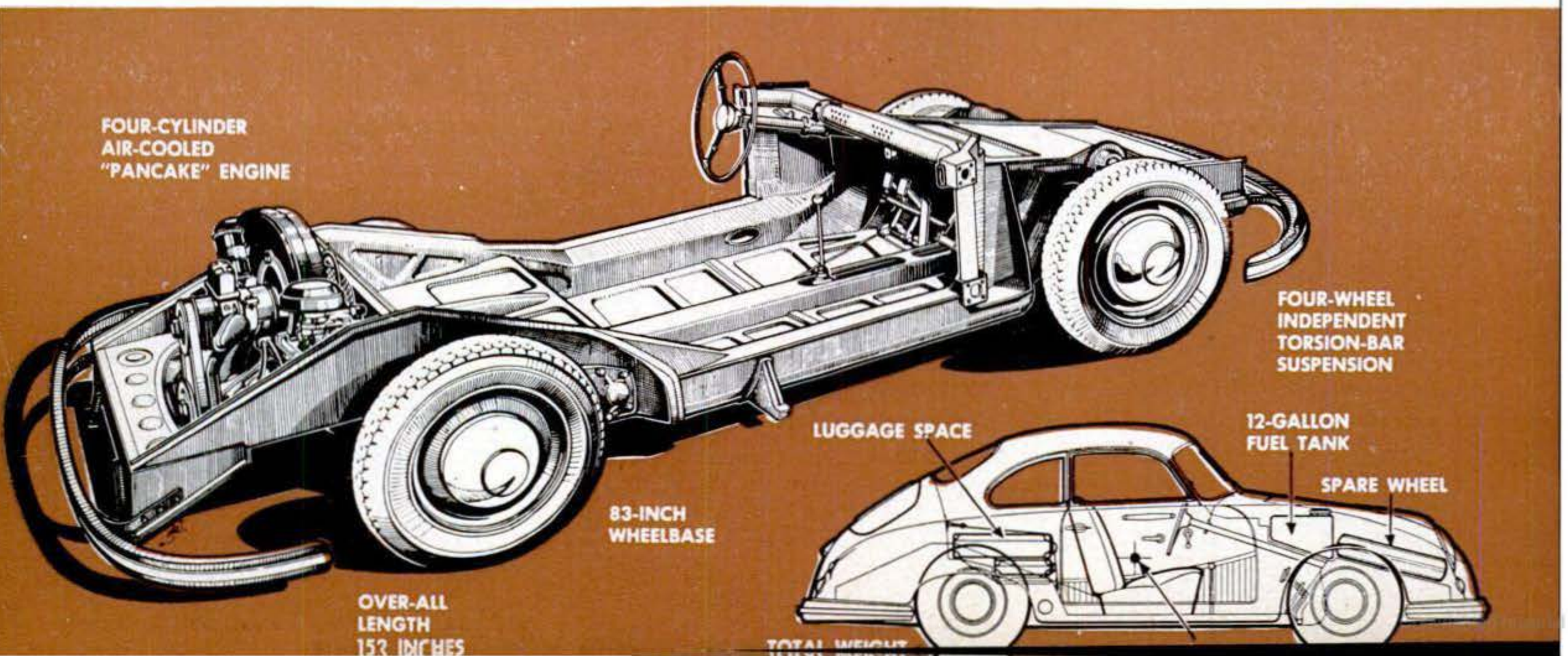
Recent trends in styling and engineering have injected new life into a controversy that has raged since horseless-carriage days.

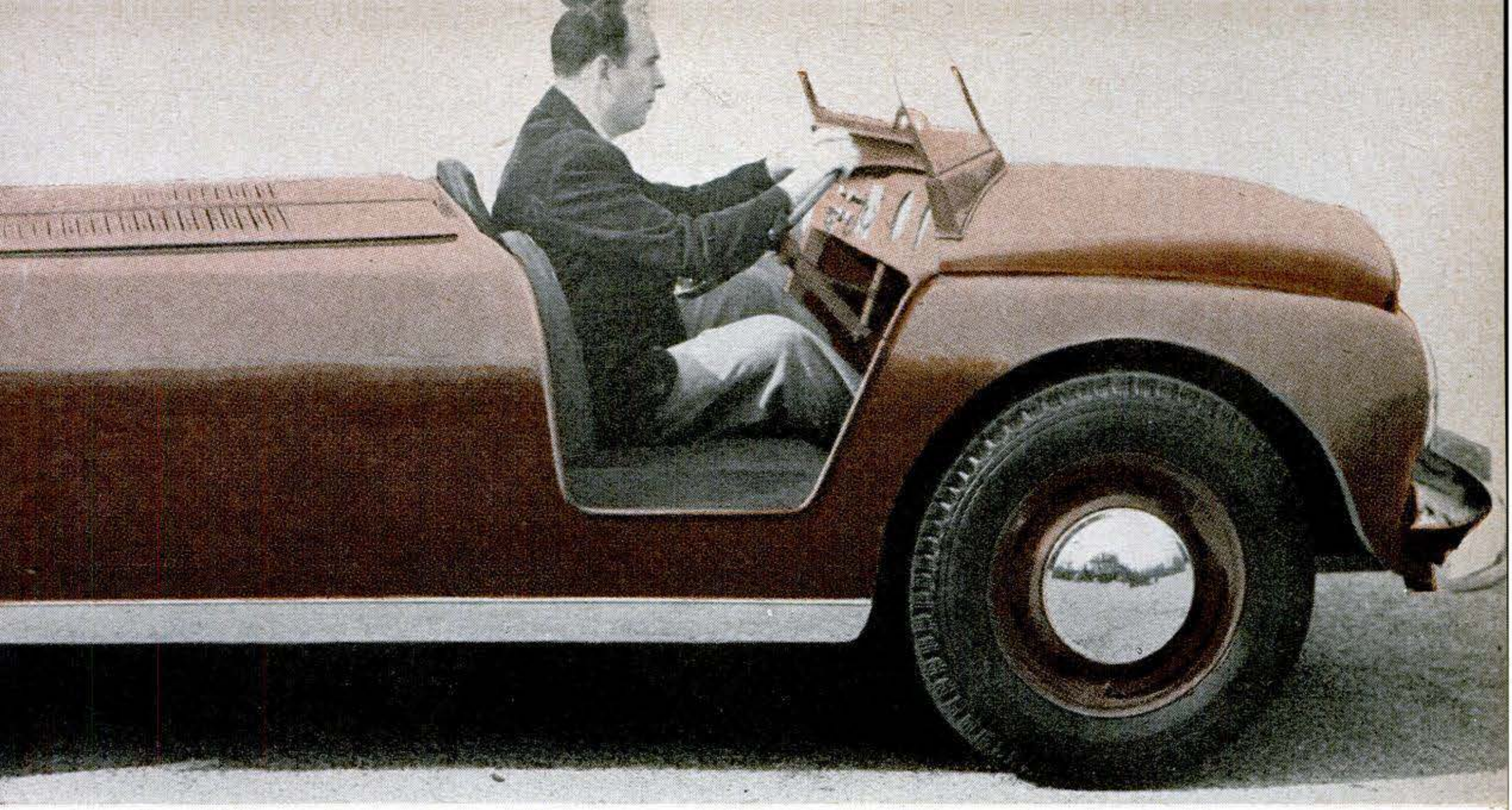
By Kendall W. Goodwyn

IN Flushing, Long Island, a young mechanical engineer named John Palermo has built himself a sports car that is really an eye-stopper. (Take a look at the picture above.) When Palermo pulls up in front of his home in this knee-high job with the long hood stretching out *behind* him, he usually has to face a barrage of questions before he can get into the house. Invariably, the first query is: "Why is the engine in back?"

To this, Palermo replies quickly, "Because that's where it belongs." If his buttonholer persists, he adds, "Because moving the engine weight to the rear gives me maximum traction on the driv-

INSIDE: Porsche's "pancake" rear engine (the four cylinders are horizontally opposed in pairs at right angles to direction of travel) delivers 40 horsepower, drives car to 85.





der light-truck engine with compression upped from 6.5 to 7.5 to 1 and horsepower from 36 to 45, the Centaur tops 80 m.p.h. Twin carbs feed two cylinders each. Four-wheel independent torsion-bar suspension adjusts for ride control. Front of car is reworked from Nash Rambler, the rest custom-built. Height less windshield: 35 inches.

ing wheels. And eliminating the drive shaft increases mechanical efficiency and makes it possible to build the car closer to the ground."

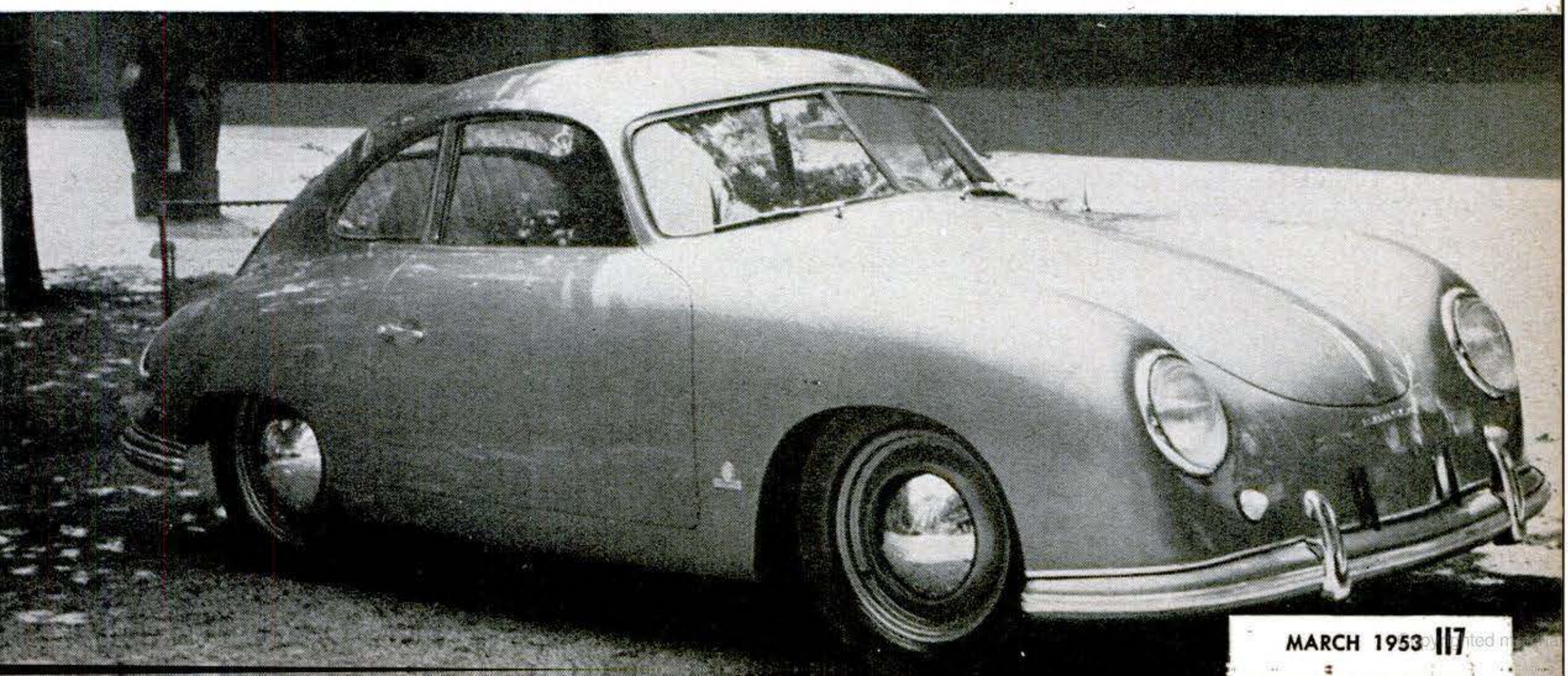
Then he makes a dash for the house, because this front-versus-rear controversy is likely to start a heated hassle anywhere. Try it yourself next time you're in a group of men.

Palermo's plausible arguments are only one small sample of the rear-engine adherents' impressive list of advantages to be gained by shifting the power plant "back where it belongs."

A well known New York automotive engineer, Alexis von Freymann, told the writer: "I am convinced that the ideal location for the engine is at the rear of the car. That is where it does its work. Engine noise, heat and gas fumes are behind the passengers. Braking effort and traction are improved by shifting engine weight to the rear axle. It is claimed that this impairs directional stability but—" von Freymann grinned—"in actual practice this is not a critical factor at speeds under 150 miles an hour."

Emphasizing the point about traction,

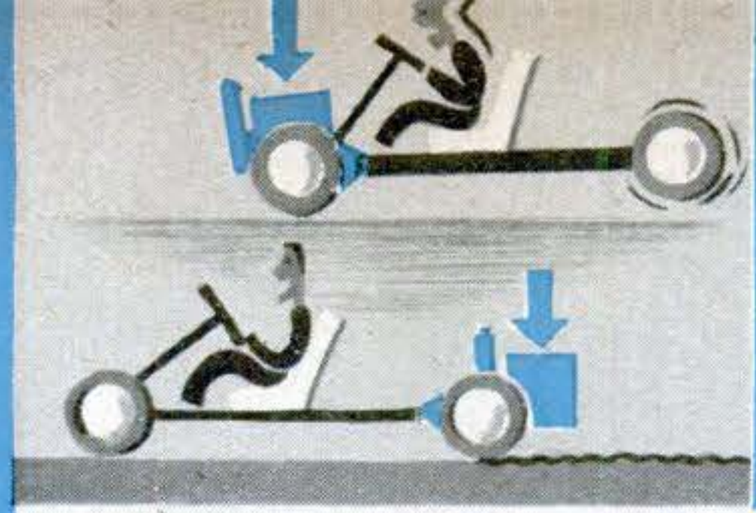
OUTSIDE: Slick postwar sportster was the final creation of the late Dr. Porsche, German designer of the Volkswagen and famed prewar Auto Union race car, both also rear-powered.



Pro

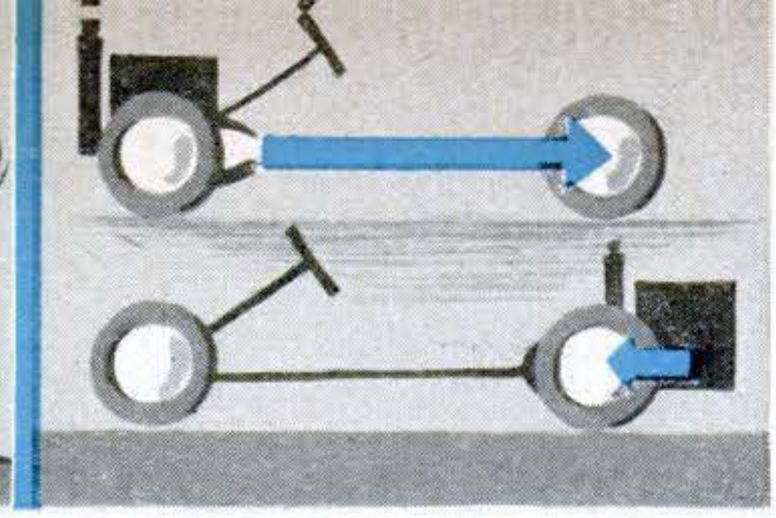
These are the five main arguments advanced by each side for and against rear-engine design.

Con



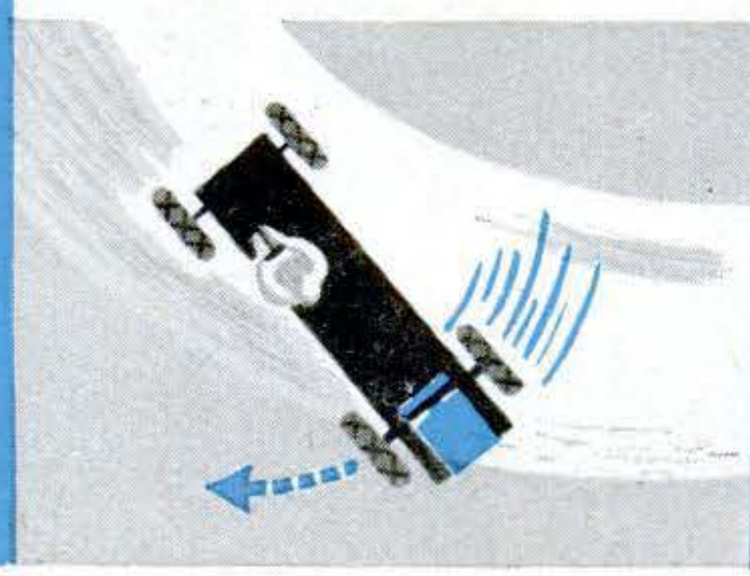
ENGINE WEIGHT on driving wheels gives better traction.

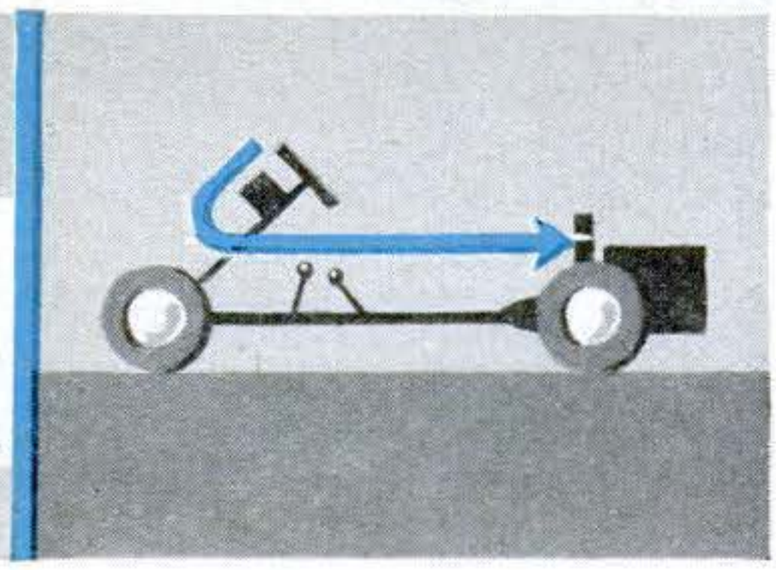
TOO MUCH WEIGHT at rear creates tendency to skid.



ELIMINATING DRIVE SHAFT adds efficiency and lowers the car.

MOVING ENGINE BACK complicates controls, cooling system.





William B. Stout, a former president of the Society of Automotive Engineers who built the rear-engine Scarab some years ago, says: "Obviously, the *most* weight should be over the wheels that push the car; the *least* weight on the wheels that do the steering. With the engine weight forward, the driving wheels cannot get enough grip in mud, sand, snow or ice to use more than a fraction of the engine's horsepower."

Braking Improves, Too

Another engineer is seriously concerned about braking efficiency: "With engines moving farther forward and too little weight on the rear wheels, the front wheels are contributing much more than their share—as high as 62 to 63 percent—of the braking effort. If the engine were moved back and passengers forward, weight distribution would be right—that is, more weight would normally rest on the rear wheels."

Why is that desirable?

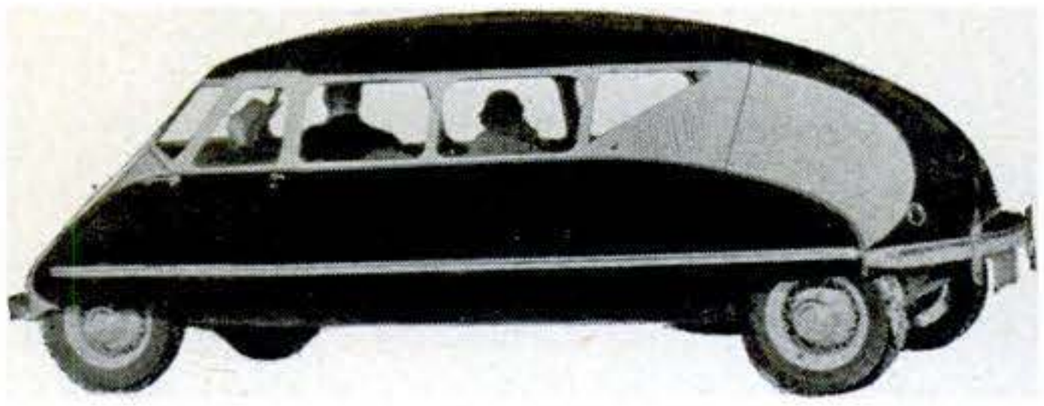
"When you hit the brakes, weight on the front wheels is sharply increased. With the rear end heavier, weight on all four wheels would tend to equalize when you jammed on your brakes in an emergency—giving you maximum adhesion when you needed it most."

But how about tire wear?

"Your front tires wear faster now for three reasons: alignment adjustments—camber and toe-in; additional road friction because the front wheels turn; and third, as mentioned before, the front wheels do more than their share of the braking. With engine weight shifted to the rear, this last condition would be corrected."

In answer to the immediate objection of most motorists that they "want something solid up front in case of a head-on crash," one advocate of rear-engine design has this to say: "The value of the engine ahead of the passengers as a safety factor is purely psychological. What really counts is the 'crumple rate' —the rate at which the car will telescope in a crash. The precise degree of rigidity

Two Experimental Rear-Engine



The Scarab, designed by William B. Stout.

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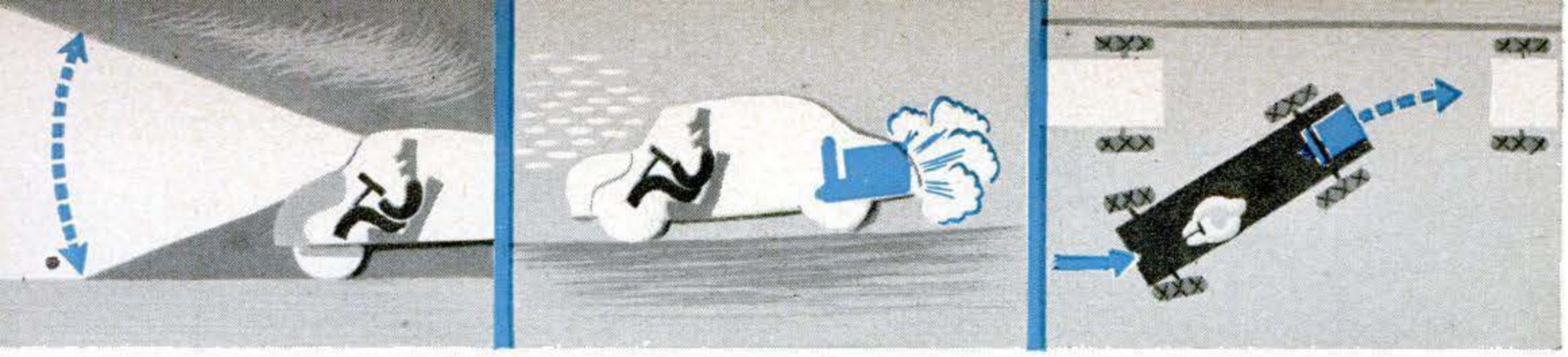


BETTER VISIBILITY for driver reduces accident hazards.

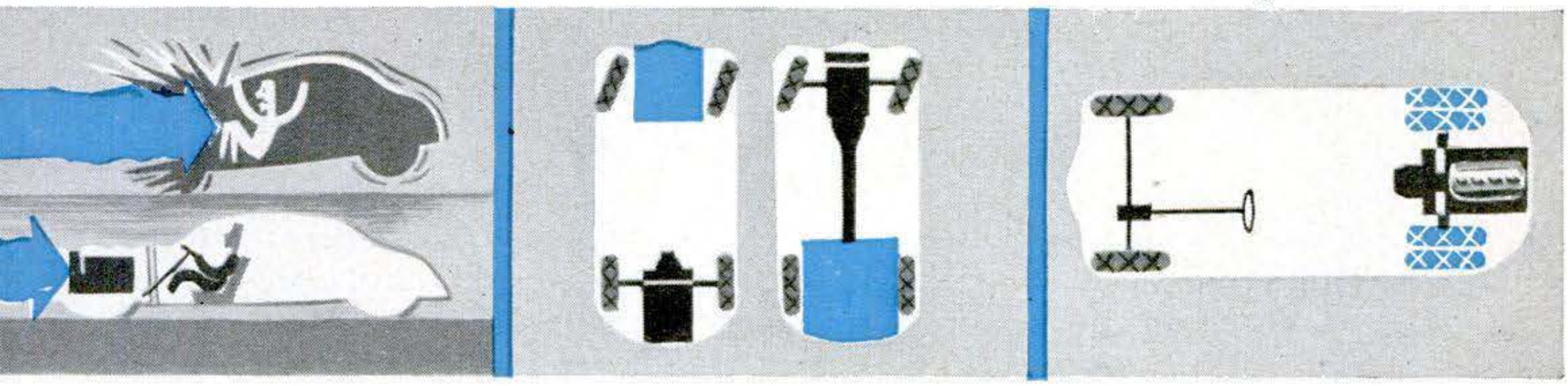
ENGINE NOISE, heat and gas fumes are behind passengers.

STEERING IS EASIER with less weight on front wheels.

ENGINE AHEAD of passengers is a safety factor in a collision.

USABLE LUGGAGE SPACE at front of car is considerably smaller.

EXCESSIVE weight at rear might require dual wheels.



to achieve optimum shock-absorbing effect is easier to control without the engine to consider."

That builds up to a rather good case for rear-engine placement. But before you rush out and trade in your "obsolete" front-engine car perhaps you'd better hear the other side of the story.

Chrysler's Engineering Division, which has conducted considerable research on rear-engine cars, sums up its conclusions: ". . . the disadvantages of placing the engine in the rear of the car profoundly outweigh the few and relatively minor advantages."

Most of the major auto companies have at various times built experimental rear-engine cars. "None of them," says a General Motors spokesman, "was ever considered superior to front-engine automobiles."

And Ford states: "The present overall car arrangement is the most advantageous from standpoint of ride and handling, 'package size,' weight and cost."

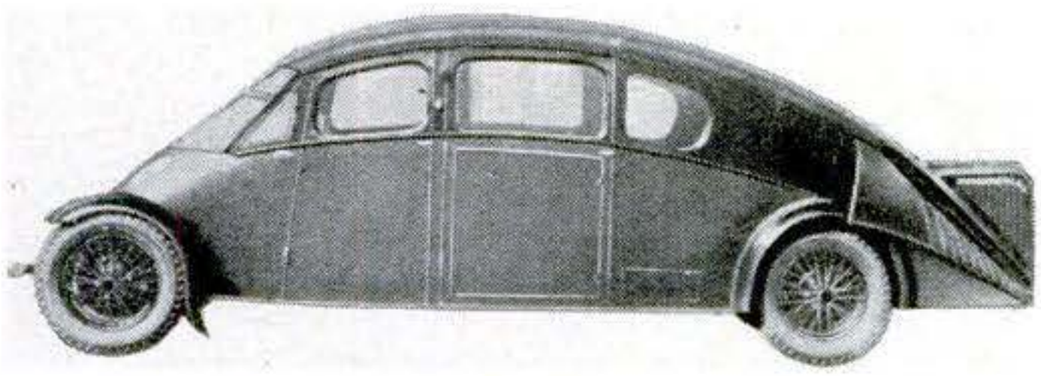
There Are Advantages—But . . .

The Big Three—GM, Chrysler and Ford—are in close agreement on the principal drawbacks of the stern-powered vehicle. They concede, in theory, such possible benefits as improved traction, better distribution of braking effort, and elimination of the floor tunnel, but—

"With engine, transmission, differential, articulated axles, etc., concentrated in the rear, a serious imbalance results which manifests itself in a strong tendency to skid. The situation might be likened to an arrow trying to fly feather foremost with the heavy point at the rear."—Chrysler.

"Luggage area available between front wheels is smaller because space must be provided for wheel housings—for the wheels to turn. It is doubtful whether many buyers would want luggage space reduced."—GM. (Even your most diehard rear-engine proponent is usually stymied on that one. But it should be noted that the five-passenger Tatra, a Czech rear-engine car, has the luggage

Cars of the Nineteen Thirties



The English-built Burney Streamline.

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THRIFTY FRENCH RENAULT gives 40 to 50 miles per gallon. Compact, rear-powered sedan weighs 1,245 pounds, will do 65. Renault also makes U.S.-style front-engine car.

THE REAR-ENGINE VOLKSWAGEN, or "people's car," developed in Germany before World War II, is now being produced in quantity—135,970 last year, one-third for export.

space between rear seat and engine.)

In reference to the safety factor—"If you were riding in a railway car, and were involved in a head-on crash, where would you rather the locomotive be—ahead of your coach or behind it?"—Chrysler.

Chrysler admits that a lightly weighted front end would mean easier steering—but points out that with power steering this factor is negligible. Ford engineers will not concede any advantage here, power steering or not: "Reduced weight and great weight variation on the front wheels according to passenger load result in unstable steering and handling."

Controls Too Complicated

All three of the major motor companies mentioned the complications of remote accelerator and transmission controls; the "plumbing" problems involved in engine cooling and car heating; the difficulty of servicing a power train in which all the components are merged in one package; the possibility that larger or even dual rear wheels might be required with such a concentration of weight at the back; the tendency to skid; the safety factor of having the engine up front as a buffer; and the loss of luggage space.

As for the effect on styling, Ford says: "Functional and space requirements would affect styling adversely, resulting possibly in a more streamlined or 'fastback' design which at least at present would be considered old-fashioned."

These then are the practical considerations. Do they rule out, once and for all, the possibility of an American-built rear-engine car? Not necessarily. To a neutral observer, the score adds up something like this:

Rear-engine location is eminently suitable for such small, light cars as the Renault and the Volkswagen, where engine weight—and consequently, weight distribution—is a minor problem (Renault engine weighs about 100 pounds vs. Cadillac's approximately 800); and where a small luggage space is adequate, for these cars do not ordinarily carry several passengers on long trips.

Rear-engine design is also fine for a lightweight luxury car like the $4,000, two-seater Porsche, which has a very respectable luggage space behind the seat.

However, for the average American motorist who wants a six-passenger sedan with a raft of horses under the hood and a family-vacation trunk compartment, front-engine location would certainly seem to be the happiest compromise . . . *at the present time.* Nevertheless, certain trends—in both engineering and styling—indicate that this may not always be so.

Rear-Engine Problems May Vanish

Engines are rapidly becoming lighter and more compact. Thus, the weight-distribution factor may eventually diminish in importance. Moreover, the public is beginning to accept the idea that a car need not boast a block-long hood to suggest power and prestige.

If these trends continue, both the engineering objections and the problem of public acceptance may gradually disappear. When that time comes, one or the other of the big U. S. auto makers will probably take the plunge. END

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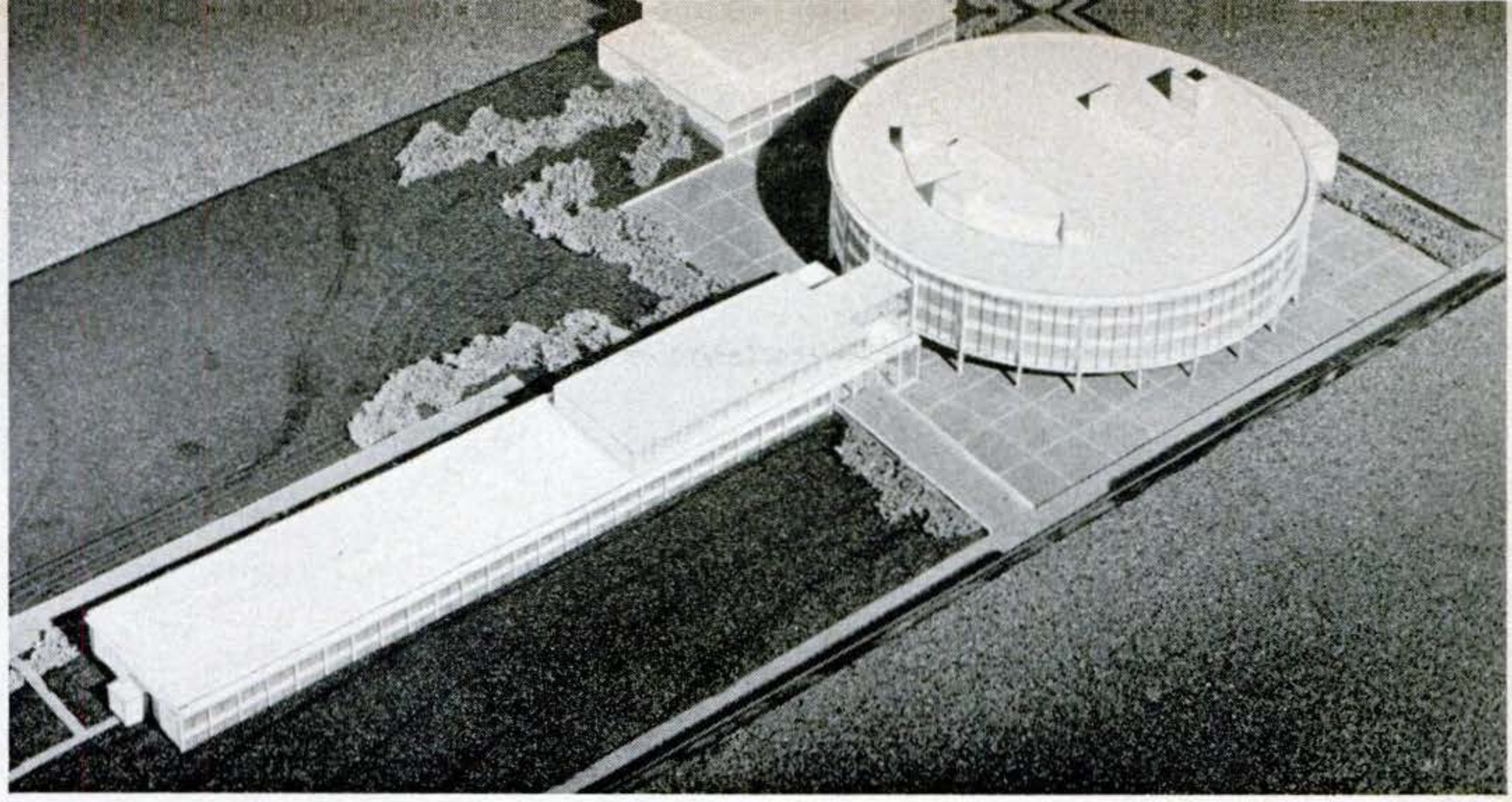


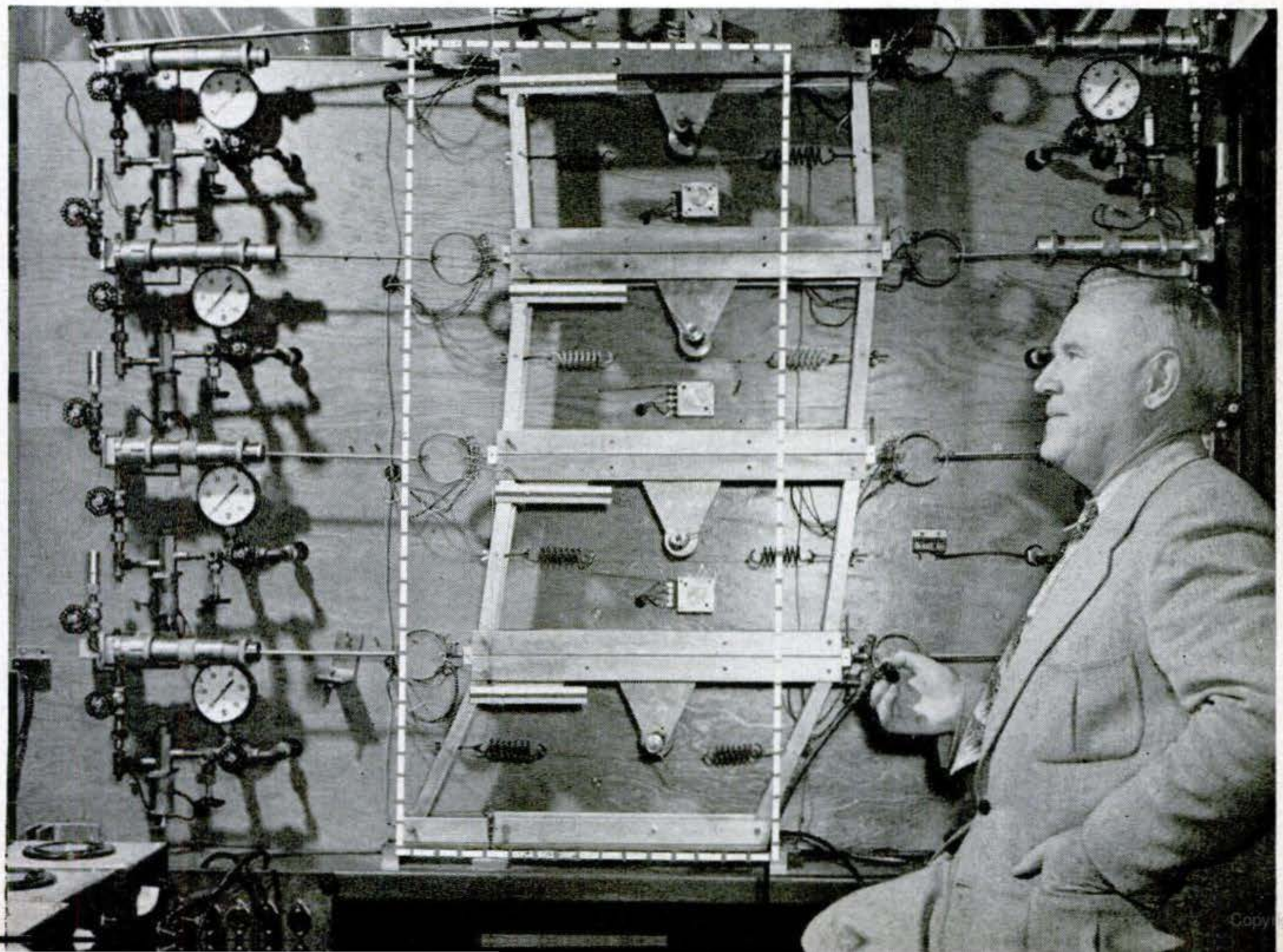
This Is a High School?—Banjo Design Cuts Travel Between Classes

A BANJO-SHAPED high school that will look like the model above is expected to save student's shoe leather—and New York City's dollars. The circular "head" houses auditorium and cafeteria at its center and has all non-science classrooms around its 235-foot rim. This cuts corridor space, say Kelly and Gruzen, the architects, while centralizing utilities in the core saves money.

Labs and shops are in the long "arm," a gym in the rectangular building. The school will cost around $6,000,000, serve 3,200.

This Is a Building?—Frames Show Bomb's Effect on Real One

MAKE-BELIEVE H-bombs blasting away at a make-believe building at Stanford University show (below) how bomb blasts would affect structures in U.S. cities. The "building" is formed of metal frames which can be adjusted to duplicate different kinds of construction. At a touch of a switch, four air-driven pistons wham in from one side. A split second later, the top piston shoves down on the "roof." Then four more pistons hit in from the opposite side. That's the way a bomb would exert pressure. Dotted lines on photo show how a "bomb" has thrown the building out of whack.



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Frit must be worked two inches into soil.

They Feed Glass to Plants Now...

GROUND glass for breakfast would ruin your health—but there's a new kind you feed to plants that makes them flourish like Jack Benny's bank account. Called "agricultural frit," it provides the mysterious trace elements essential to plant growth—and in a form that even amateurs can use without risking harm to their plants.

Marketed under the name FTE—Fritted Trace Elements—the product contains manganese, iron, zinc, copper, boron and molybdenum. Applied to greenhouse flowers it promotes earlier blooming and larger blossoms. Used on field crops, it has sent potato harvests up 40 percent, added a ton an acre to Maine corn crops, boosted cabbages, blueberries, tomatoes.

The minerals are melted into glassy porcelain enamel so that they won't wash

How frit boosted chrysanthemum growth.

The sprayed grass is on the right.

...And Mow

away in the soil as soluble salts do. Scientists believe the elements are released partly by ionic exchange with plant roots with which the frit comes in contact, and partly by slow weathering away of the glass. The action is so slow there's no danger of an overdose—and the frit lasts at least a full season, sometimes two or three.

Ferro Corp., a manufacturer of porcelain enamel, developed FTE in collaboration with a number of scientists, including Dr. F. L. Wind of Michigan State College and Dr. Norman F. Childers of the New Jersey Agricultural Experiment Station. Ferro will sell it directly to fertilizer manufacturers to add to their product, while du Pont will handle retail distribution of the pure product to homeowners.

Ferro's scientists say that they still don't know how to tell whether a soil is lacking in trace elements except in extreme cases. The only way to find out is to add them—and see if crops grow better.

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MH reduced mowing along Merritt Parkway in Connecticut from 19 times a season to once.

the Grass with Rocket Fuel

YOU can't throw that lawn mower away entirely—but it looks as if you'll soon need it only once a year. That's all the cutting required after grass has been sprayed with a new chemical, also used to zoom rockets. Called maleic hydrazide, or MH, it's already available for big acreages and for homeowners to use on borders and hard-to-get-at corners.

MH must be applied evenly or the lawn will have a wavy effect. That requires a power spray—which is why it isn't feasible for home gardeners to spray a whole lawn with hand equipment. But before long you may be able to hire somebody with a power rig to do the job for you each spring. It is sprayed on when the grass has grown about an inch and a half. Then the lawn is mowed about three weeks later—for the last time that season.

The chemical works as an "anti-hormone," stopping the growth hormones from doing their job. The grass is uninjured but becomes dormant, just as it does in winter. It may become thicker at the base during this period, and because it doesn't mature—a brown stage in many grasses—it may be greener than untreated lawns. But just the right amount must be used or the grass will either start growing again or else turn brown from an overdose.

The spray has no effect on broad-leaved plants and there is little danger of its drifting where it isn't wanted. It doesn't hurt animals or people. About 10 pounds of MH are needed for an acre. At present the price in small quantities is about $1.00 an ounce—which will cover about 250 square feet.

MH is made by the U. S. Rubber Co., and will be marketed by a number of firms. Right now the Loamium Co. is selling it under the name of Kem-Kut.

Are you looking for a site for a new home? See the April issue of Popular Science Monthly for an expert's advice.

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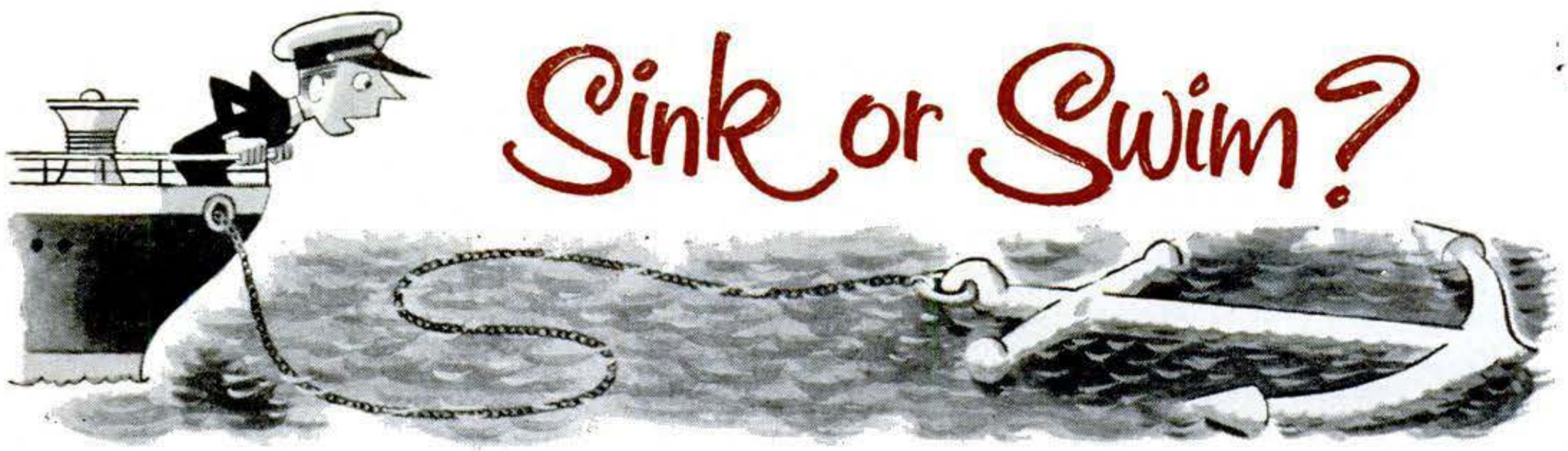
Navy Planes Now Angle In

MANY Navy bombers have such wide wing spans that they must operate dangerously close to the edge of a carrier's deck in order to clear the ship's island structure. On the USS *Antietam* the problem has been solved by adding an angled section to the port side, as shown in the aerial photo at right. This makes for safer landings by directing the planes away from the island, and also will make it possible to carrier-base some larger bombers. The new supercarriers now under construction will also have the angled deck, even though they will have no island obstruction.



METAL floats and wood sinks, if the metal is lithium and the wood lignum vitae. The specific gravity of lithium (.534) is only about half that of water (1). Lignum vitae, a hardwood from which ship's propeller bearings are sometimes made, has a specific gravity of 1.25.

But what about the more common solids and liquids listed in the next column? Will they sink or swim? The answers, with the specific gravity of each given, appear upside down at the bottom of the column. Rate yourself unusual if you can run up a perfect score.

1. Chalk_____
2. Ice_____
3. Celluloid_____
4. Tar_____
5. Paraffin_____
6. Mica_____
7. Rubber_____
8. Turpentine_____
9. Camphor_____
10. Sealing Wax_____
11. Leather_____
12. Glycerin_____
13. Milk_____
14. Gasoline_____
15. Butter_____

Answers: ***1.*** Sink 1.9; ***2.*** Swim 0.917; ***3.*** Sink 1.4; ***4.*** Sink 1.02; ***5.*** Swim 0.87; ***6.*** Sink 2.6; ***7.*** Sink 1.1; ***8.*** Swim 0.87; ***9.*** Swim 0.99; ***10.*** Sink 1.8; ***11.*** Swim 0.86; ***12.*** Sink 1.26; ***13.*** Sink 1.028; ***14.*** Swim 0.66; ***15.*** Swim 0.86.

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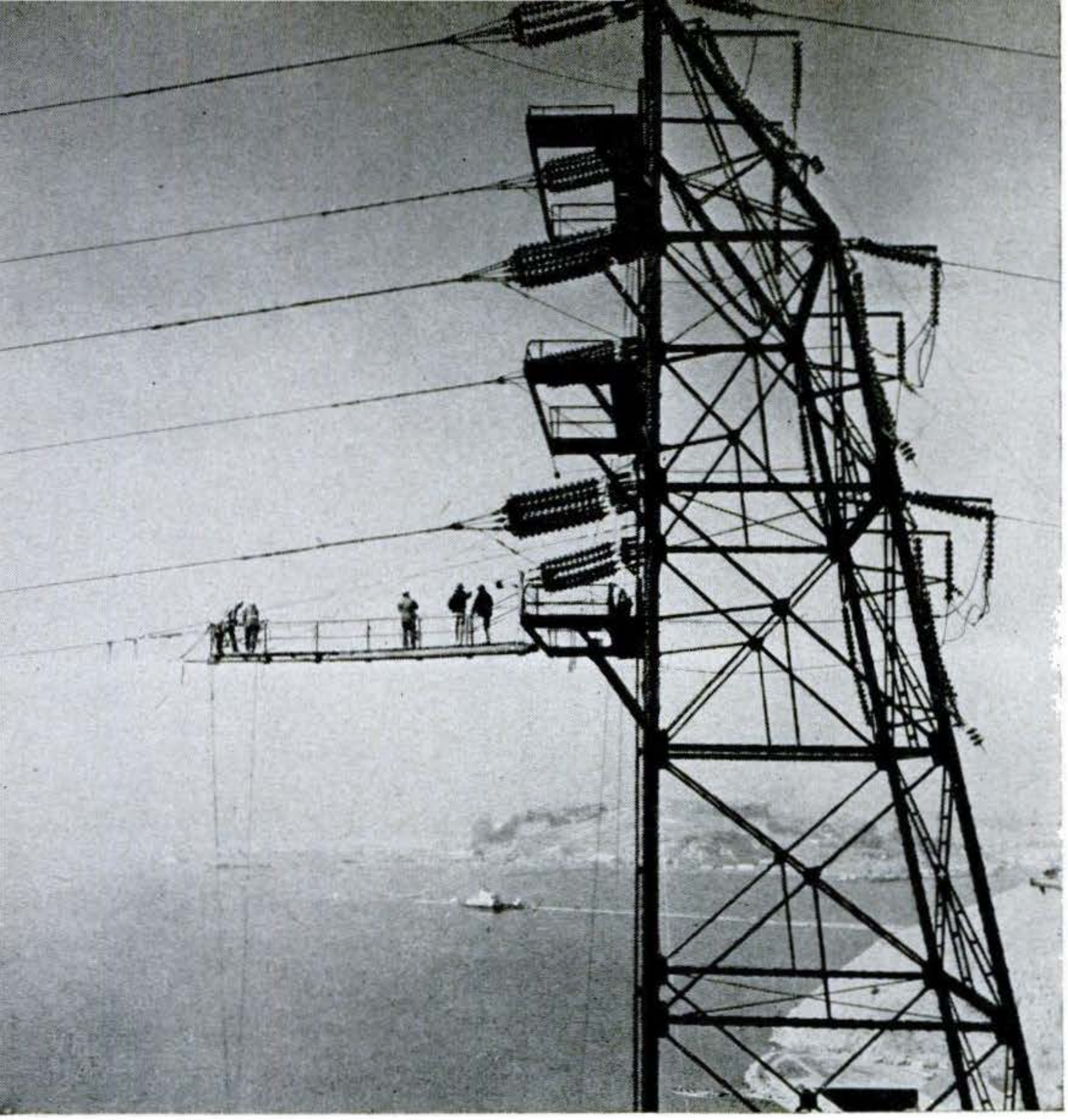

They Fight Wind Over Frisco Bay

WHEN high winds howl across San Francisco Bay, power lines take a beating—and so do the men who have to keep them in repair. Severe weather conditions that prevail in the area challenge the ingenuity of maintenance crews. At left you see how they met one situation when a cable of the Pacific Gas and Electric Co. threatened to snap, cutting the city at the Golden Gate off from hydroelectric power originating in the High Sierras. After current in the line was turned off, the men thrust out a 60-foot telegraph pole, lashed and braced it. On it they built a railing-enclosed catwalk.

Tractor Hauls Freight Cars

HUSKY enough to pull five freight cars, this big tractor will do the work of a medium-size switching locomotive at less cost. An off-center coupler lets its deep-cleated pneumatic tires run on the ballast to left and right of one running rail. Unlike ordinary switch engines, the Hough Payloader track-hops its way from one car-hauling job to another, eliminating complicated moves through switches.

They Say Now.....

"The doctor's mistakes are buried in the grave. Trees and ivy cover the architect's failures. The engineer's works are out in the open where all men can see them." —HERBERT HOOVER.

"Few drivers survive the experience of braking their vehicles in an emergency at 70 miles an hour."—THOMAS N. BOATE, INSURANCE EXECUTIVE.

"I hope man never learns to control climate . . . if he does it will produce more trouble than the atom bomb. Look at the difference between the ideas of the tourists and the farmers on rain." —DR. H. W. AHLMANN, SWEDISH CLIMATOLOGIST.

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F9F Panther jets, their wings folded, ride the USS *Boxer*'s flight deck toward the Korean

Battling 'Boxer' Flings 1-2 Punch Off Korea

THESE drawings dramatize one of the heroic tales of the Korean war: the saga of the aircraft carrier USS *Boxer*.

In 30 months the *Boxer* has sent her Skyraiders, Panther jets and Corsairs on more than 60,000 sorties against the enemy. Rushing planes across the Pacific, she has twice broken speed records for the crossing. The feats of her airmen have become legend, and her crew has more than once set records for fast refueling and ammo loading.

Recreating scenes no camera could catch, the drawings were made by Herb Hahn,

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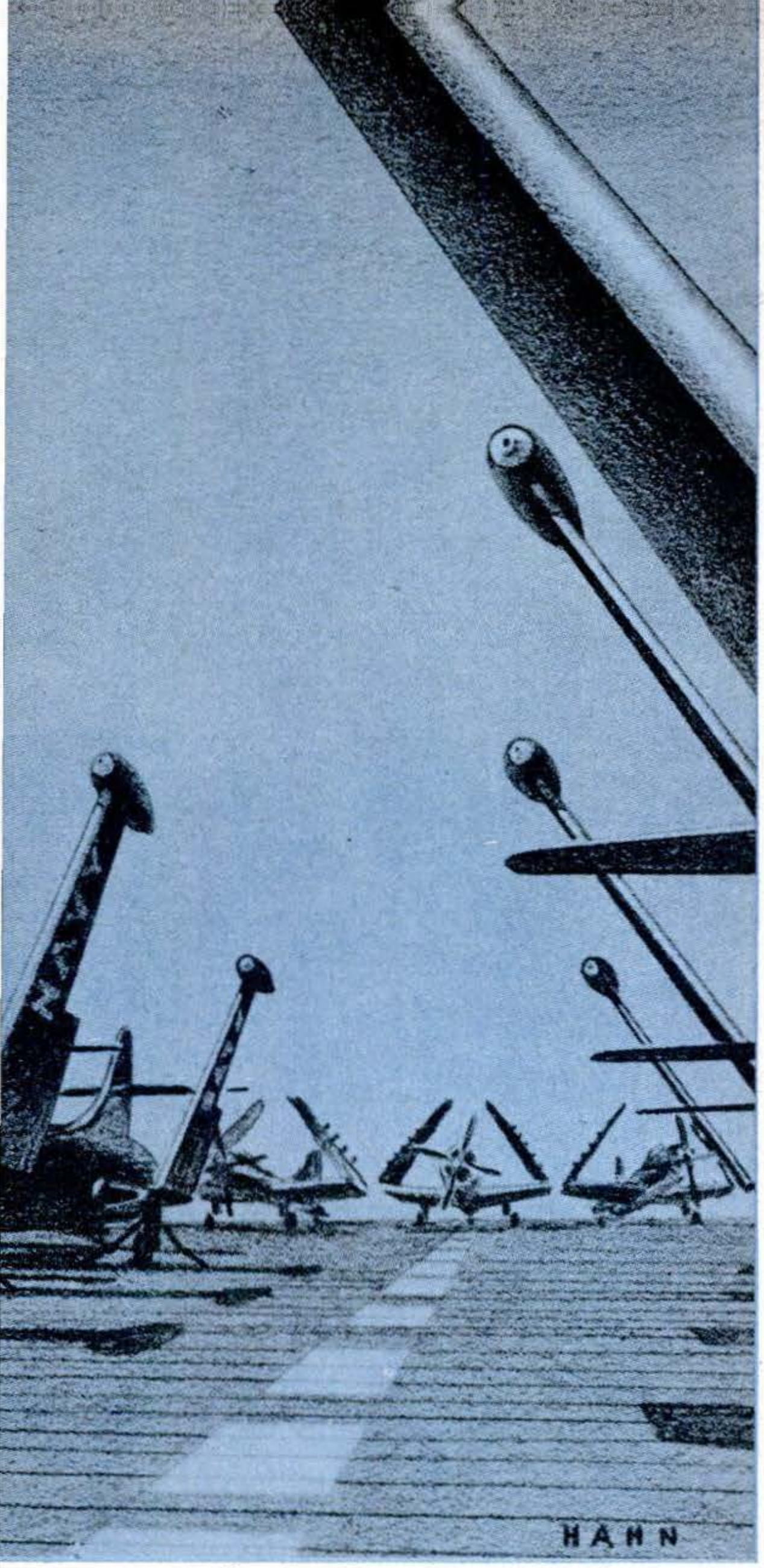
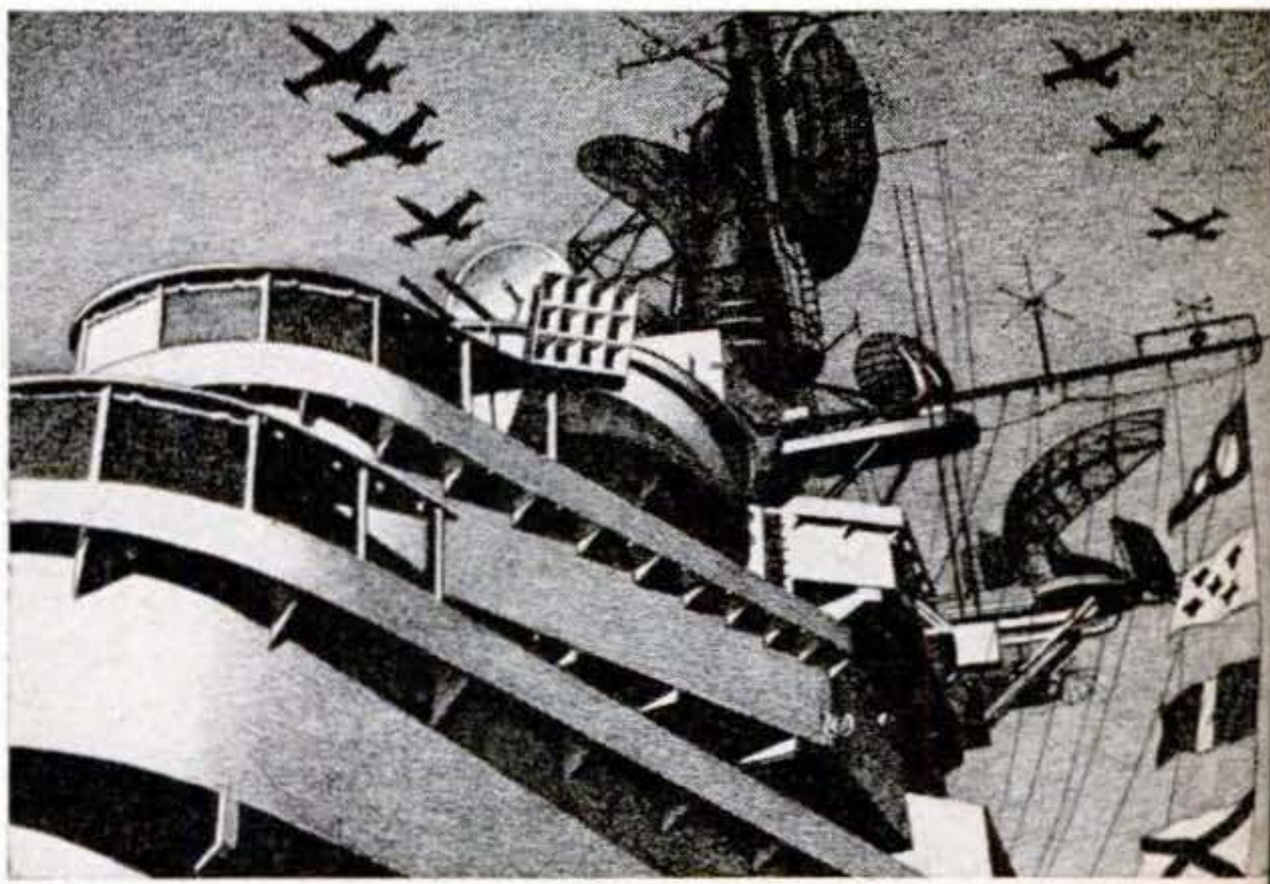
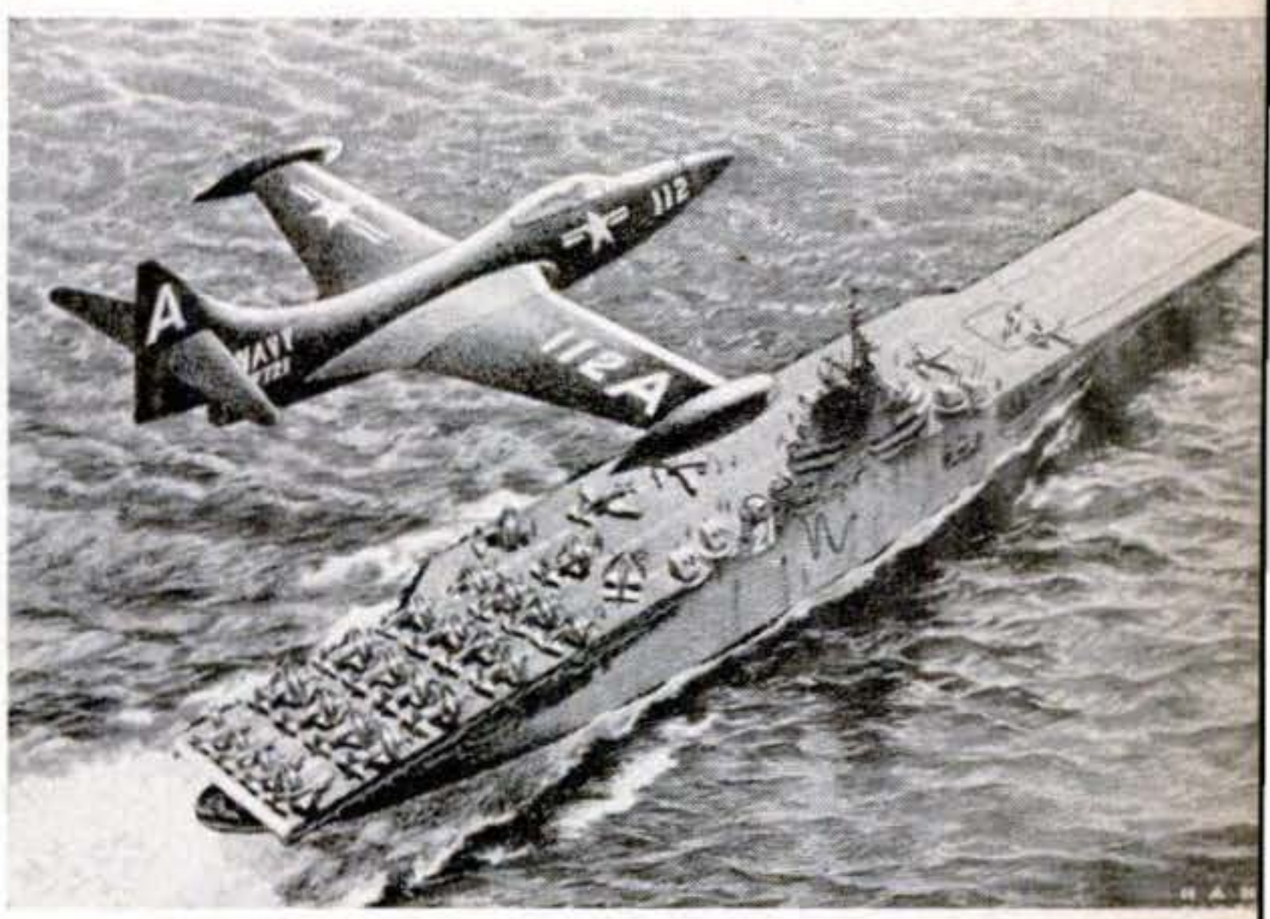


coast. Carrier flies about 100 planes.

HEAVILY LADEN Douglas AD takes off to hit Wonsan. Hahn got deck angle from 'copter.

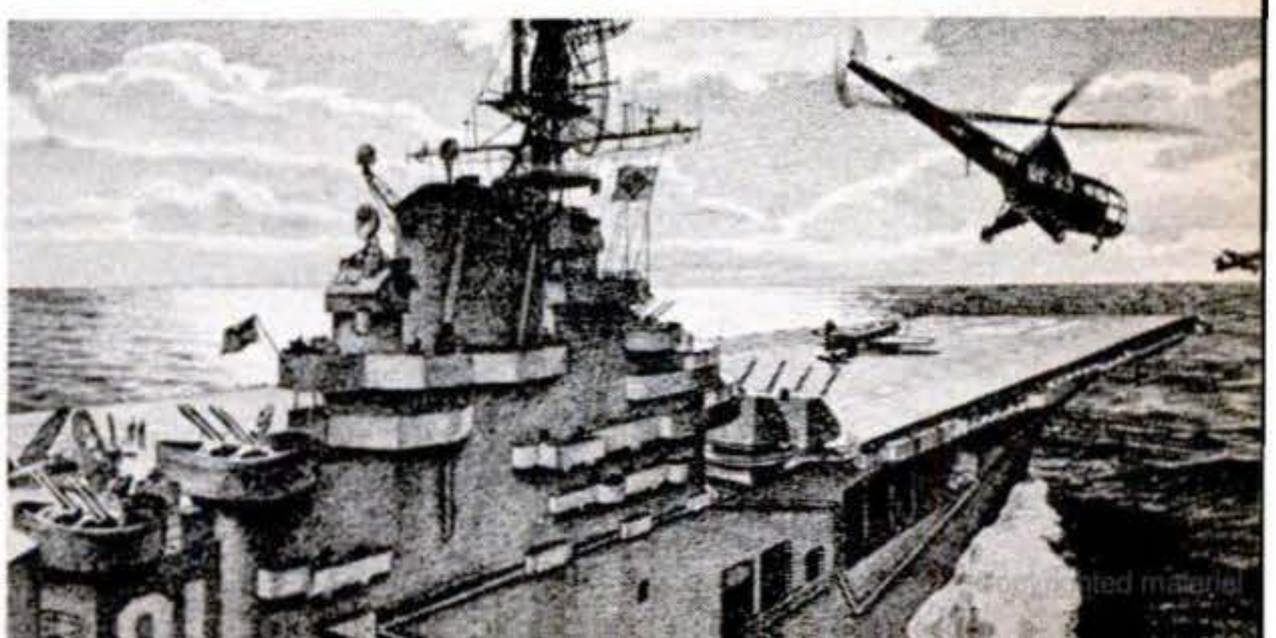


ABOVE THE CARRIER, Panther jets circle while forming into a group pattern for a strike.



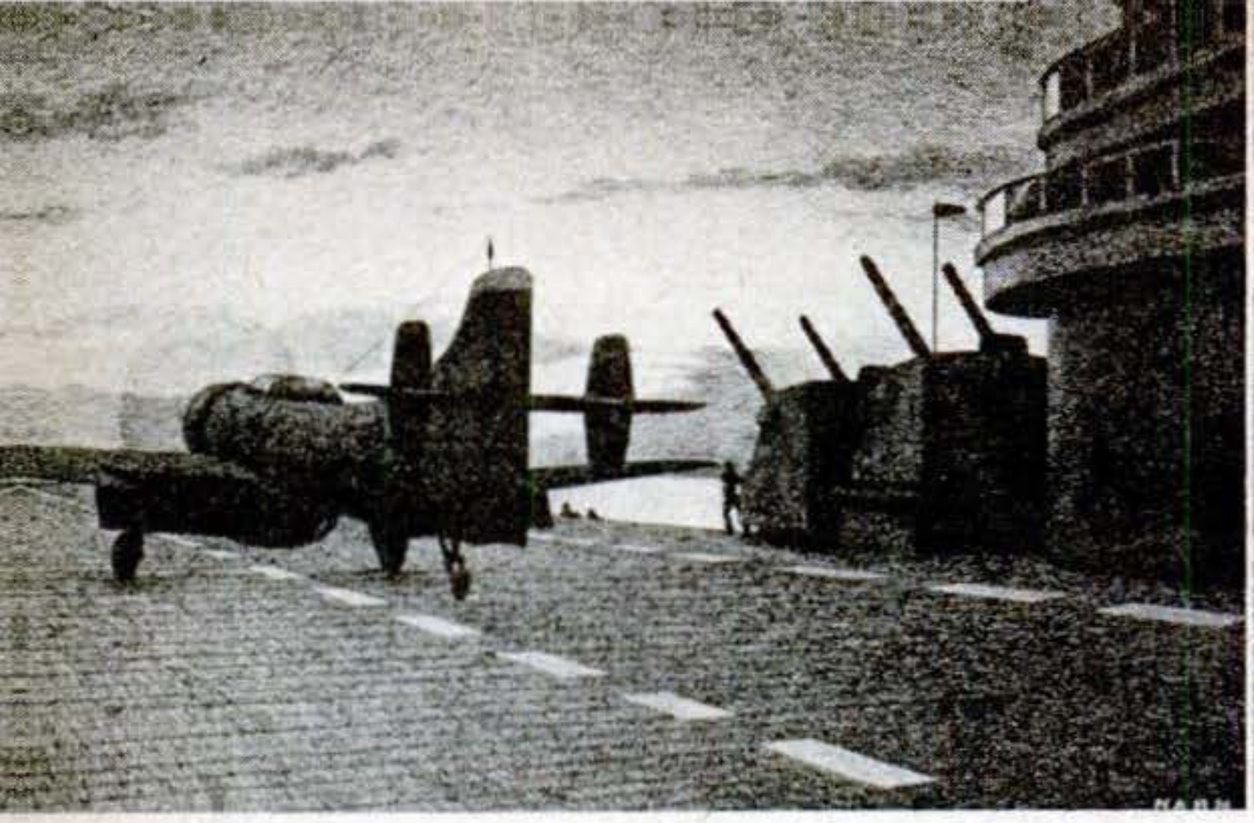
PANTHER JET climbs for altitude. Clear forward deck on carrier shows take-offs going on.

HELICOPTERS replace destroyers as plane guards; pick up crashed pilots in seconds.



officially a photographer first class, from rough sketches done on the flight deck and aboard a helicopter circling the carrier. They are chosen from 75 drawn over 10 months.

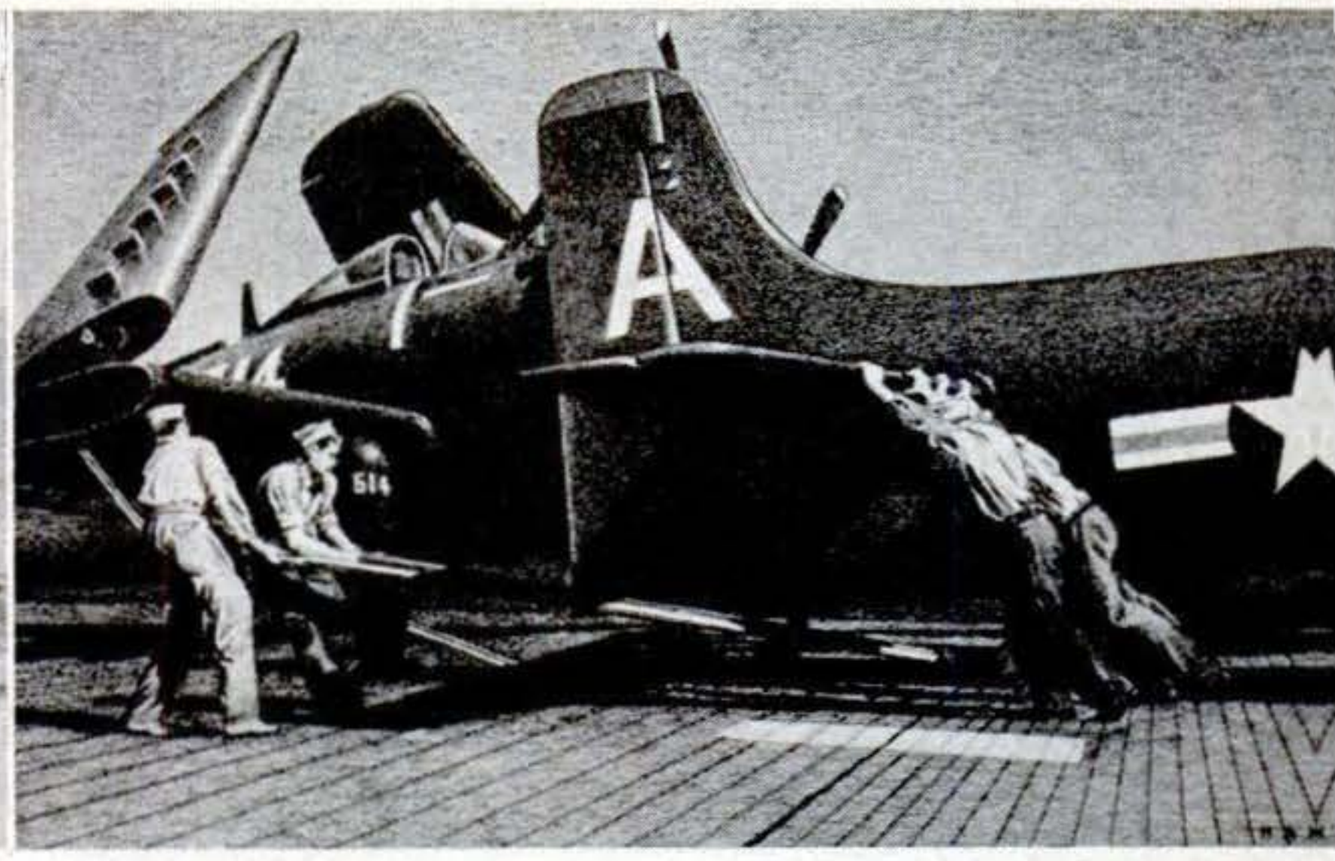
Hahn, a Los Angeles movie artist and book illustrator before being called to active duty in the Navy, is now back in civilian life. His Navy work, shown here for the first time, will be displayed at the Fifth Annual California Hobby Show in Los Angeles, March 20 to 29. Later the Navy will show the pictures throughout the country.—*Andrew R. Boone.*



EACH DAWN, an AD Skyraider roars through gloom to look for subs with sensitive radar.

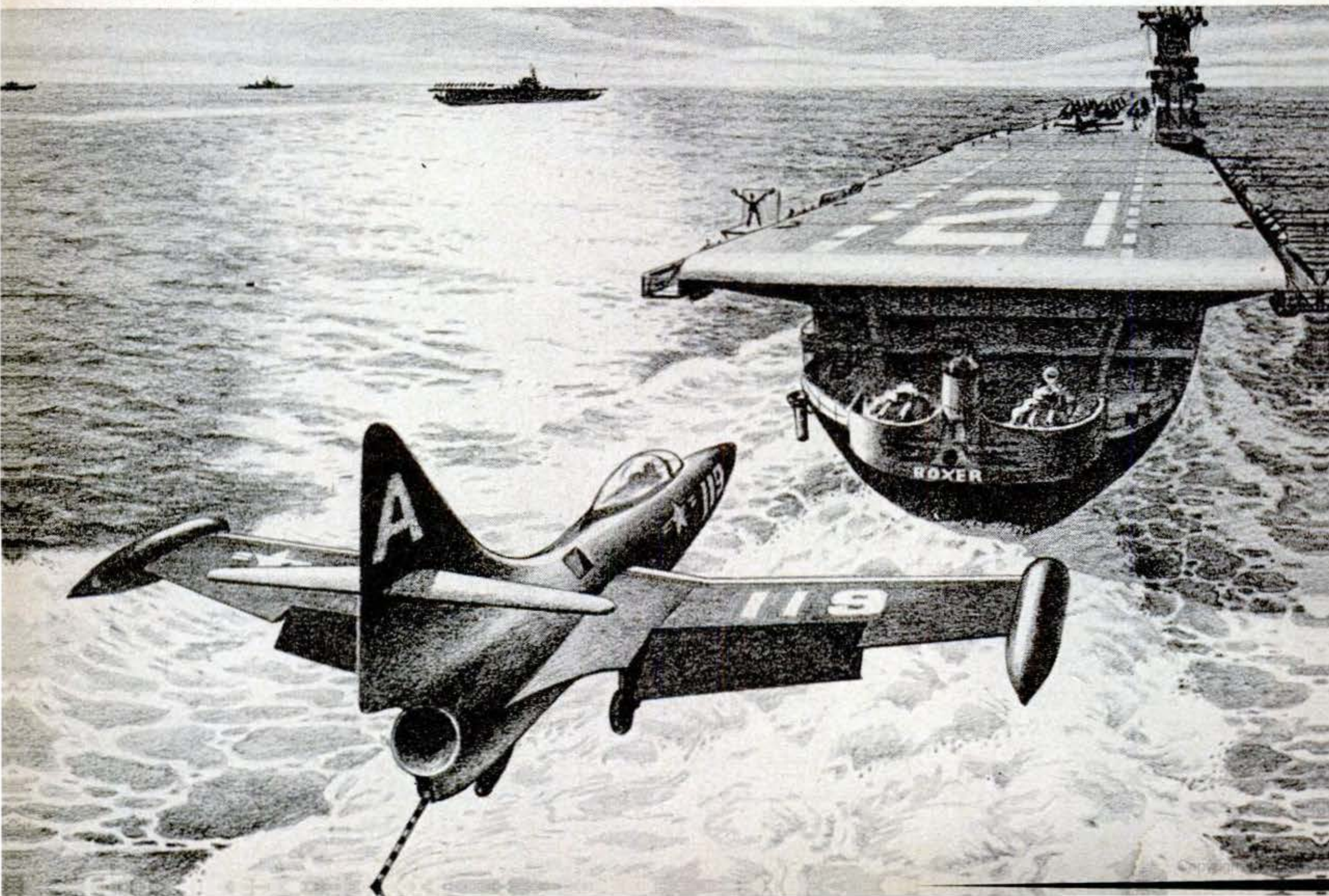
CORSAIR'S ROCKETS pin-point a Russian-made T-34 tank somewhere in North Korea.

MOKPO, held by enemy on North Korean west coast, is attacked by the *Boxer*'s Corsairs.



FIRST PLANES BACK from sortie must be rushed behind crash barriers or moved below.

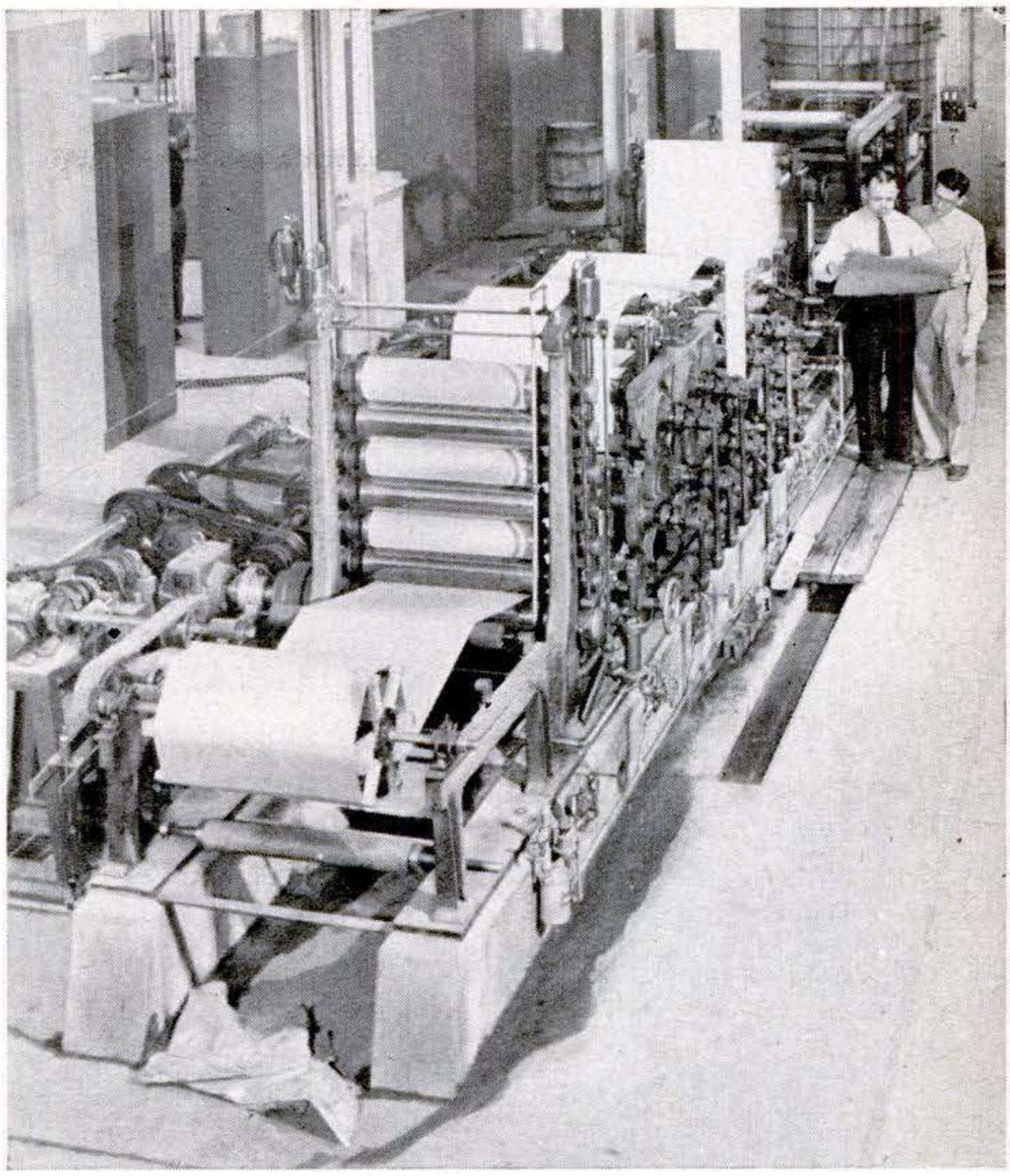
"In the groove," a jet pilot waits for the landing officer's flag signal to chop his throttle.



Scaled-Down Paper Mill Cuts Cost of Research

WHAT you see at the right is a complete paper mill in miniature. Instead of grinding forest giants to a pulp, it chews up "logs" of stovewood no larger than five inches around in a chipper run by a 30-horsepower motor. In contrast to a full-size paper machine that may run a city block in length, the little mill has a 40-footer that processes the pulp and turns out 25 to 250 feet of paper a minute.

Papermaking is a continuous-process industry and often a whole mill is shut down while engineers make test runs or solve production problems. This baby plant, set up in a laboratory of the Crown Zellerbach Corp. of Los Angeles, will let the big fellow keep on the job all the time.



Dutch Army Vehicle Humps Over Rough Spots Doing 15 M.P.H.

THIS Dutch gun tractor and personnel carrier can roll over the roughest terrain with a load of 11 soldiers, 1½ tons of ammunition and a 105-mm. gun. It can travel the roads at 40 miles an hour on six wheels, slowing down to 15 in rough country. When the going gets really tough, another set of wheels is lowered and the gun is automatically disengaged and trailed slack on a 55-yard cable to lighten the load. The driver disengages or recouples the gun, pays out or rewinds cable without leaving his seat. Engines and gearboxes used in the YA-318 are American-made.

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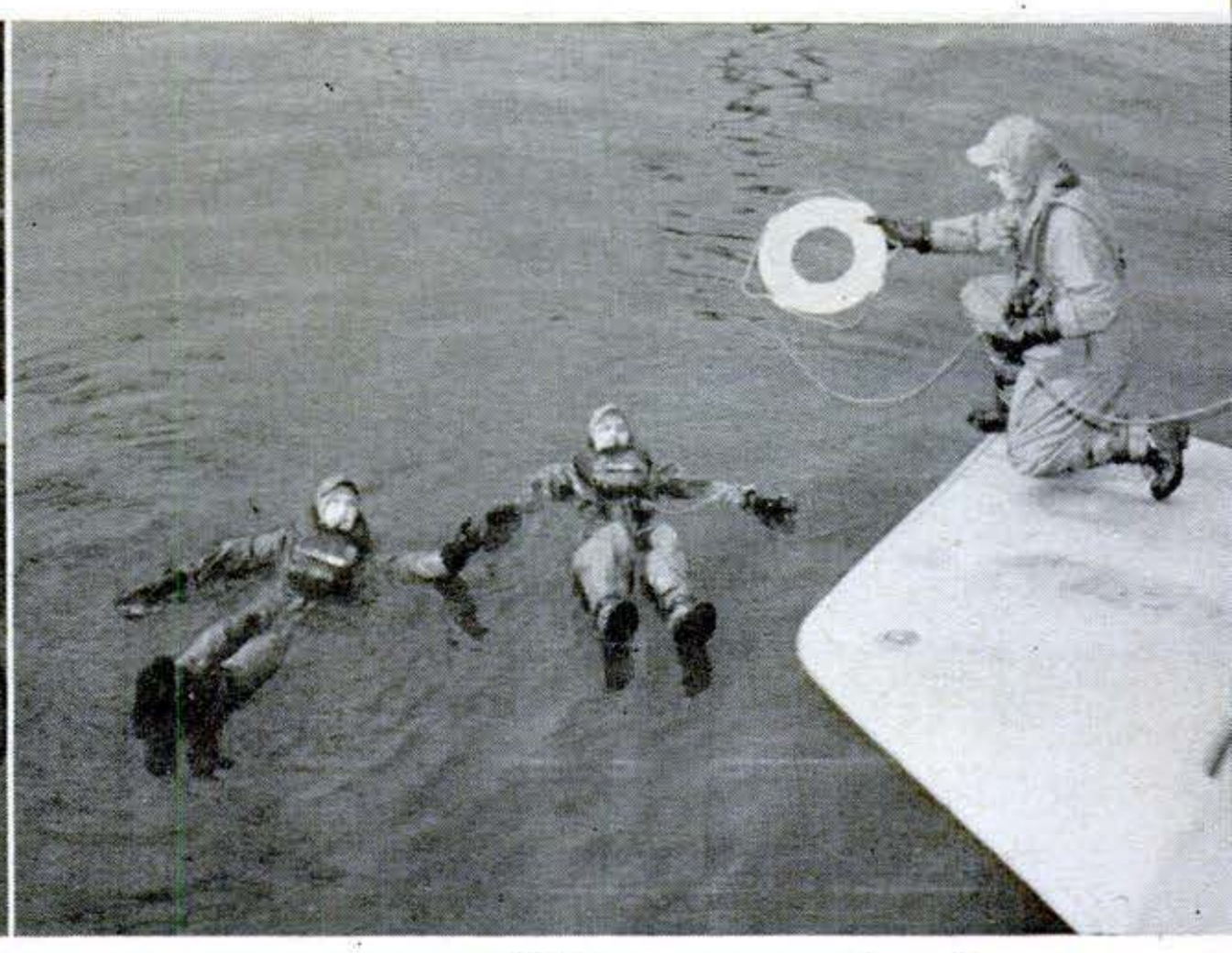
WEARING THEIR NEW SUITS, lookouts take their places on the submarine USS *Gato.* To insure a watertight fit at wrist, mittens (left) of high elasticity go over steel rings embedded in sleeves. A steel ring is also molded inside the tops of the insulated boots. Elastic trouser cuffs stretch over the rings. A Navy spokesman says he believes that the only problem the suit does not solve is how to blow your nose.

Spray Suit Keeps Sub Crews Dry

IT'S so cold and wet on the deck of a surfaced submarine that lookouts frequently cannot stay on duty more than 20 minutes. Wearing this new neoprene-coated nylon exposure suit, the Navy claims they will be able to keep working as much as six times longer. The suit has watertight seals at ankles, wrists and neck—even waterproof zippers—and is flexible enough to permit all normal movements.

PRESSURE-SEALING ZIPPER is made waterproof by strips of rubber over metal tracks. In closing, strips are forced to overlap each other.



AIR TRAPPED IN SUIT will keep a man afloat for a short time if he falls overboard. A life jacket, however, is worn with the garment.

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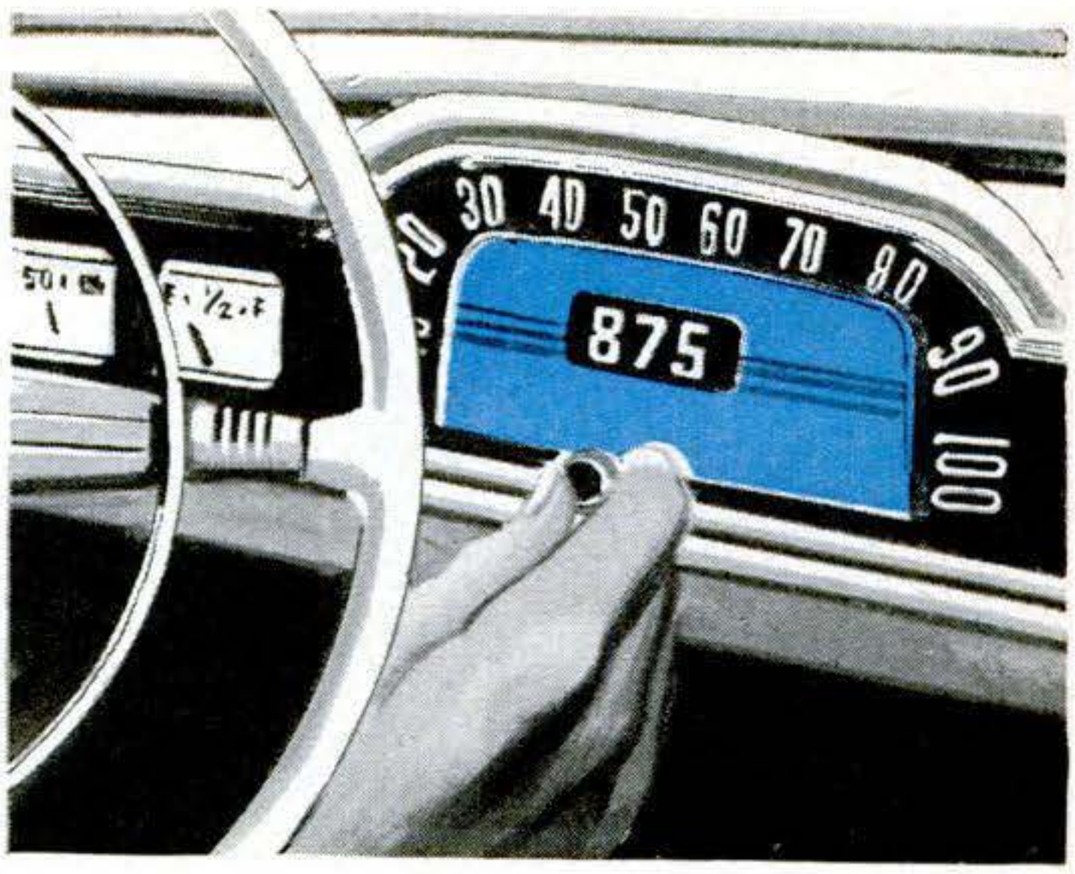
I'd Like to see them make...

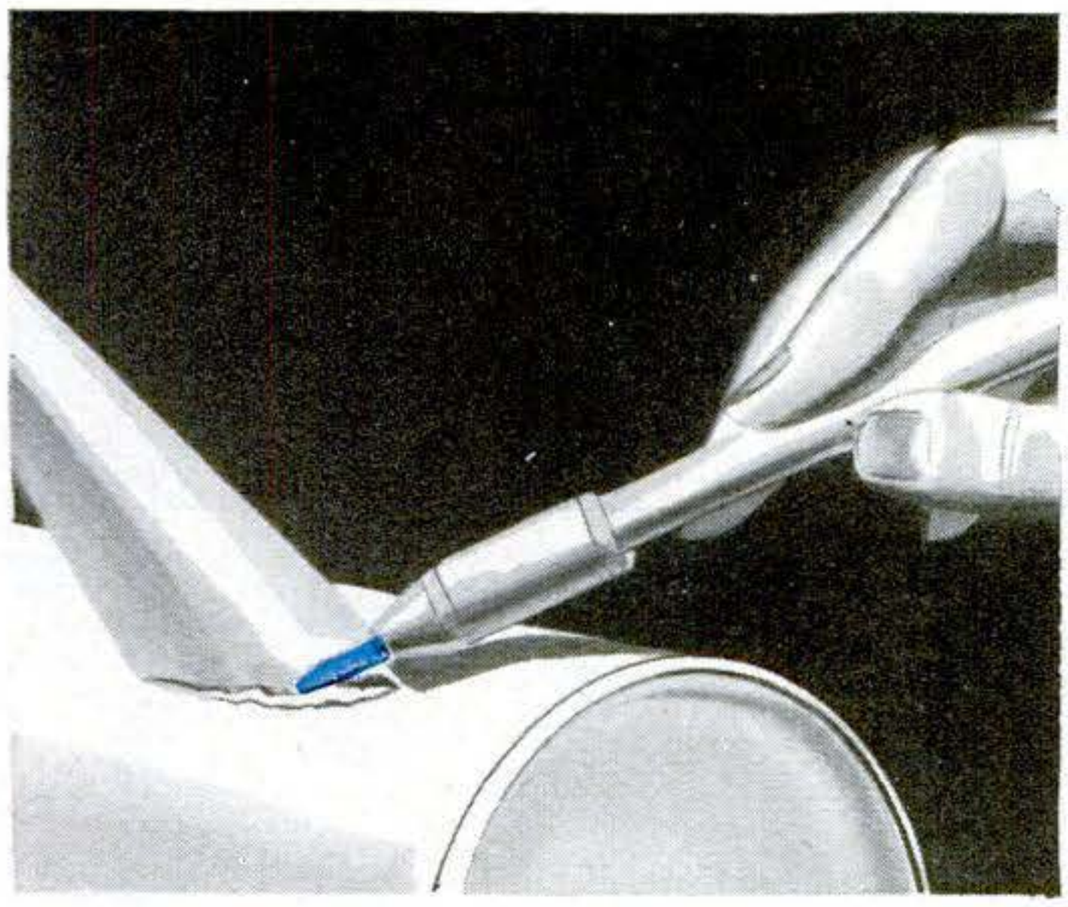
Everyone has his own pet idea of some gadget he would like to see in general use. What is YOURS? *Popular Science Monthly* will pay $5.00 for each one published. Use government postcards only. Contributions cannot be acknowledged or returned.



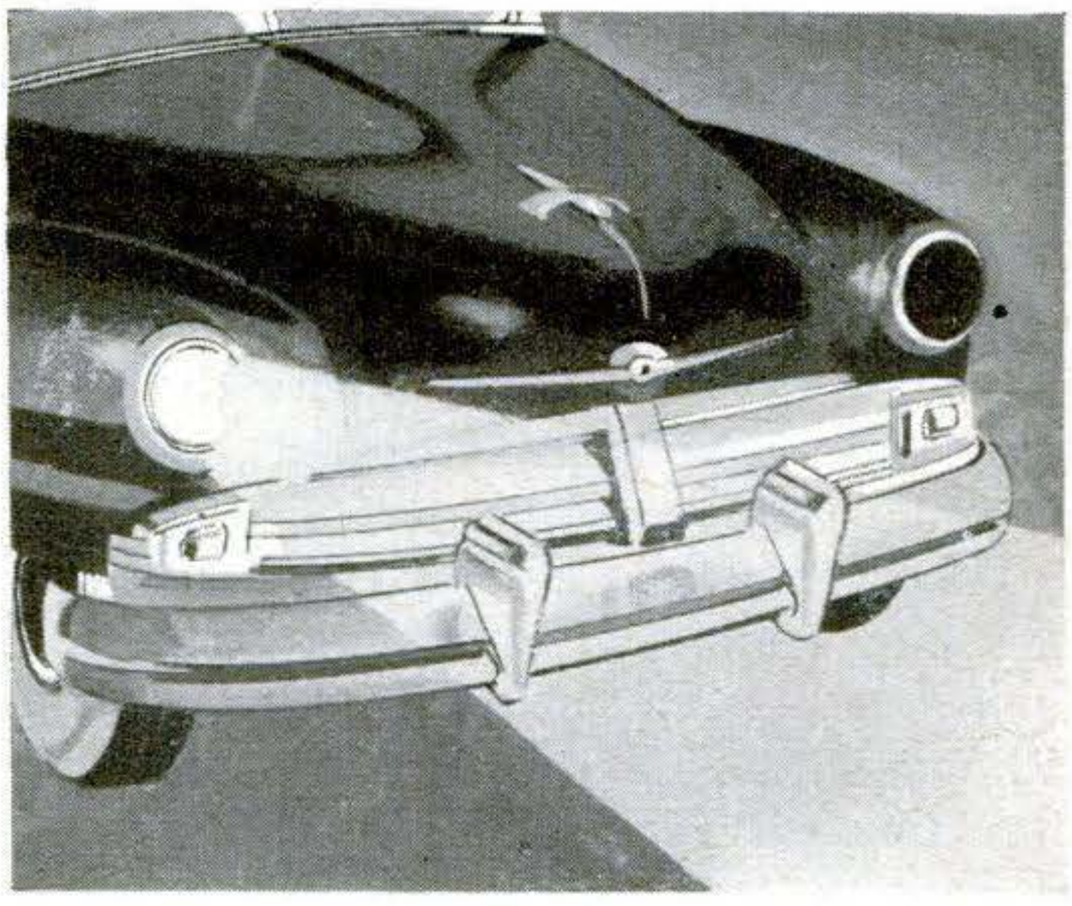
A MILEAGE INDICATOR that worked in reverse. You could set it at the distance to your destination and tell at a glance how far you had left to go.—*R. E. Henke, Chowchilla, Calif.*

VENETIAN BLINDS with a light-sensitive device that would adjust them automatically to admit a constant amount of light, no matter how daylight varied.—*A. G. Howard, NYC.*

PHONOGRAPH RECORDS with a brief announcement at the beginning, telling what selection or movement you were about to hear played.—*Milton Wolff, Gibsonia, Pa.*



A SOLDERING IRON constructed like an automatic pencil. The soldering wire would be inside the iron and could be fed out as needed.—*James E. Blair, Portland, Ore.*



REFLECTOR RINGS around auto headlights. When a headlight burned out, the reflector would let oncoming motorists know which light was gone.—*J. M. Krzyscin, Avoca, Pa.*

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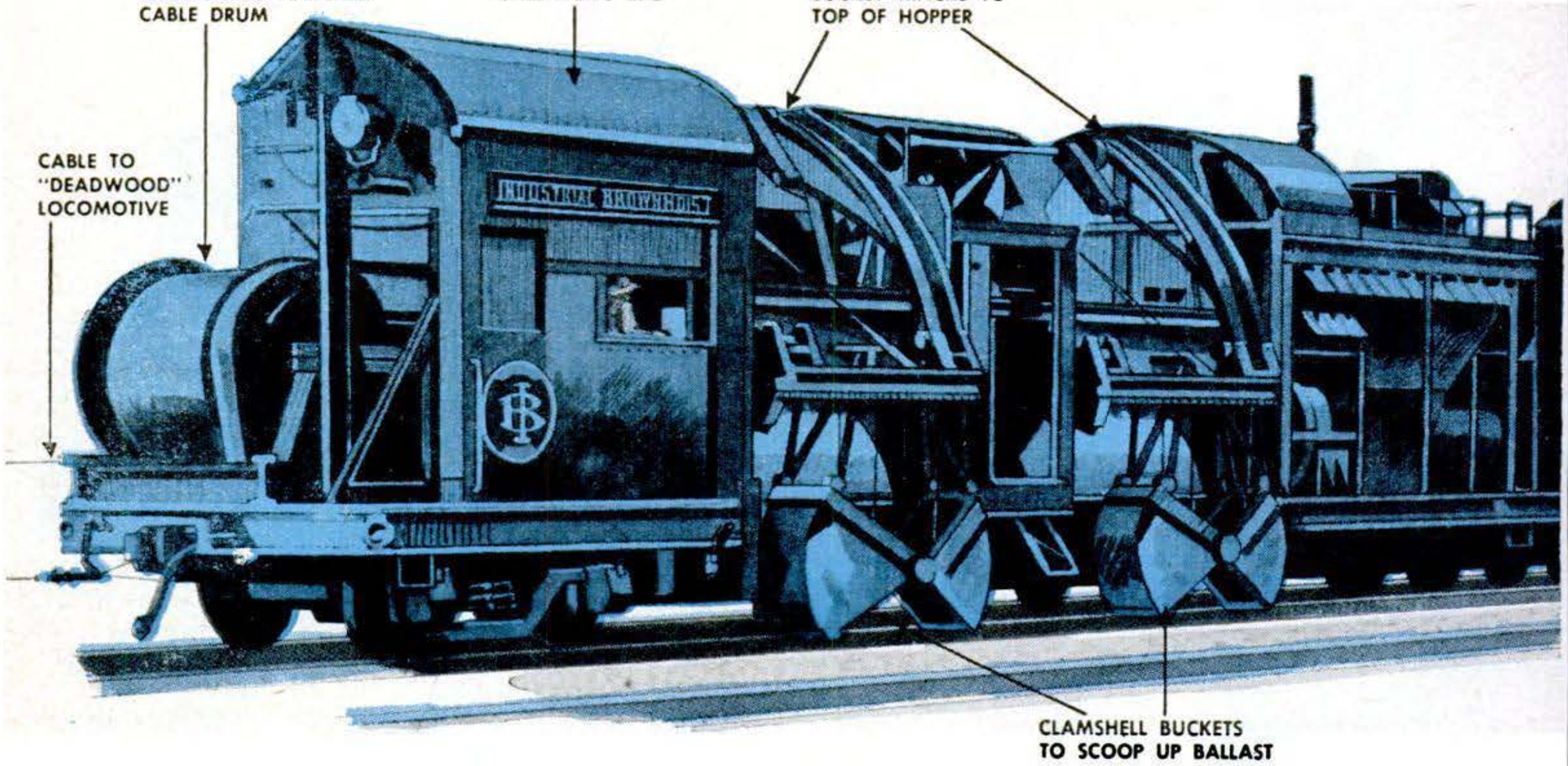
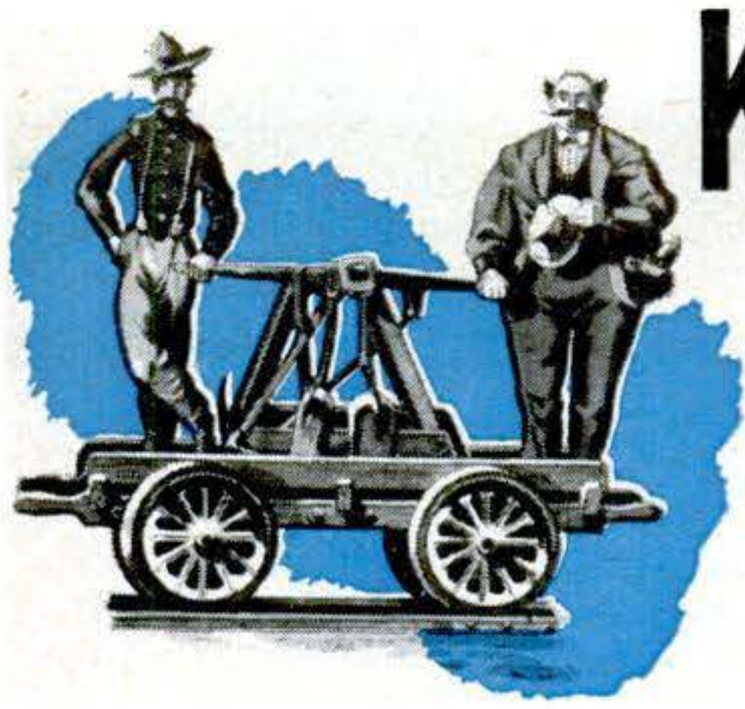


Mechanical Gandy Dancers Keep Trains Rolling

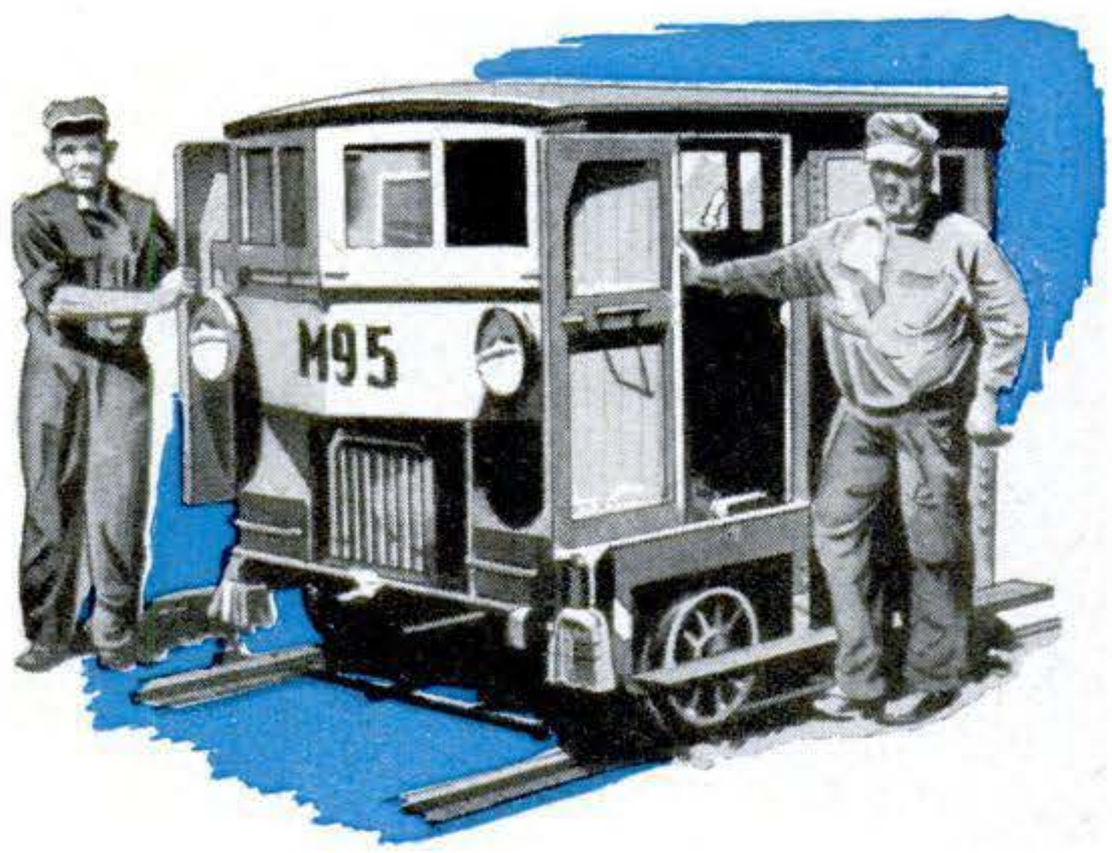


By Henry B. Comstock

THE old ballast fork is fast going the way of the oil headlight and the open-platform observation car. Blame modern track machines for that, and for the disappearance, on many railroads, of the five-man section gang.

Time was when each crew, made up of a king snipe and four gandy dancers, took a belligerent pride in the smooth-riding qualities of its five-mile stretch of line. Once a year the division superintendent put every section to the water-glass test. Let a drop slosh over the rim of a well filled tumbler in his private car and the boys had to wait 12 months for another crack at the coveted "Prize Section" sign.

Today much of that job belongs to big district gangs—18-man, mechanized forces which swarm over a division with the impact of a plague of grasshoppers, mowing down weeds, opening ditches, shooting new ballast, rooting out the old sleepers (31,000,000 ties were replaced



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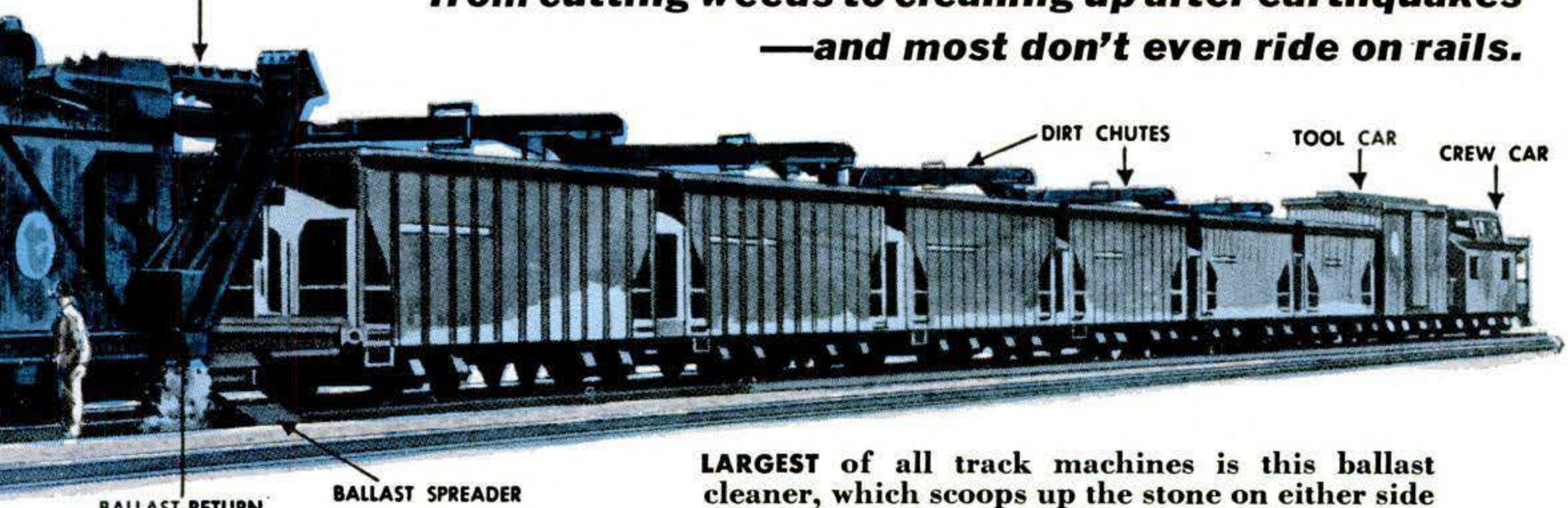
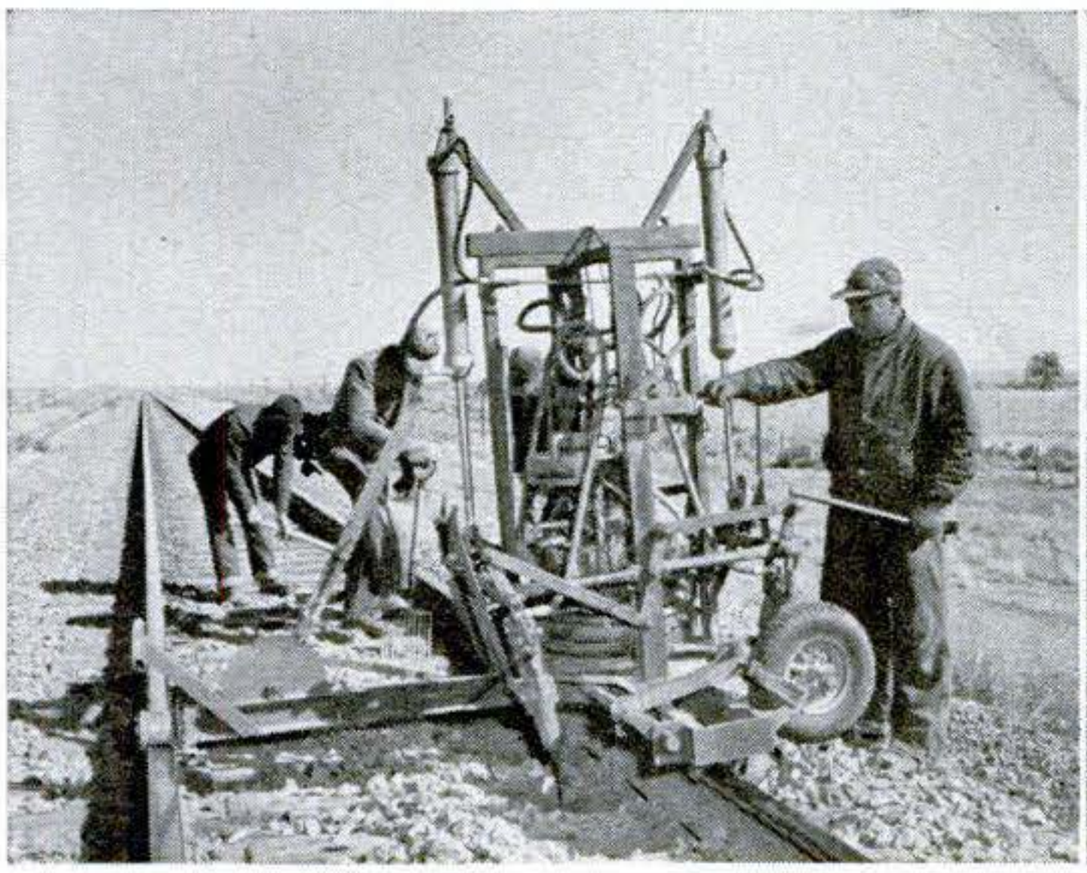
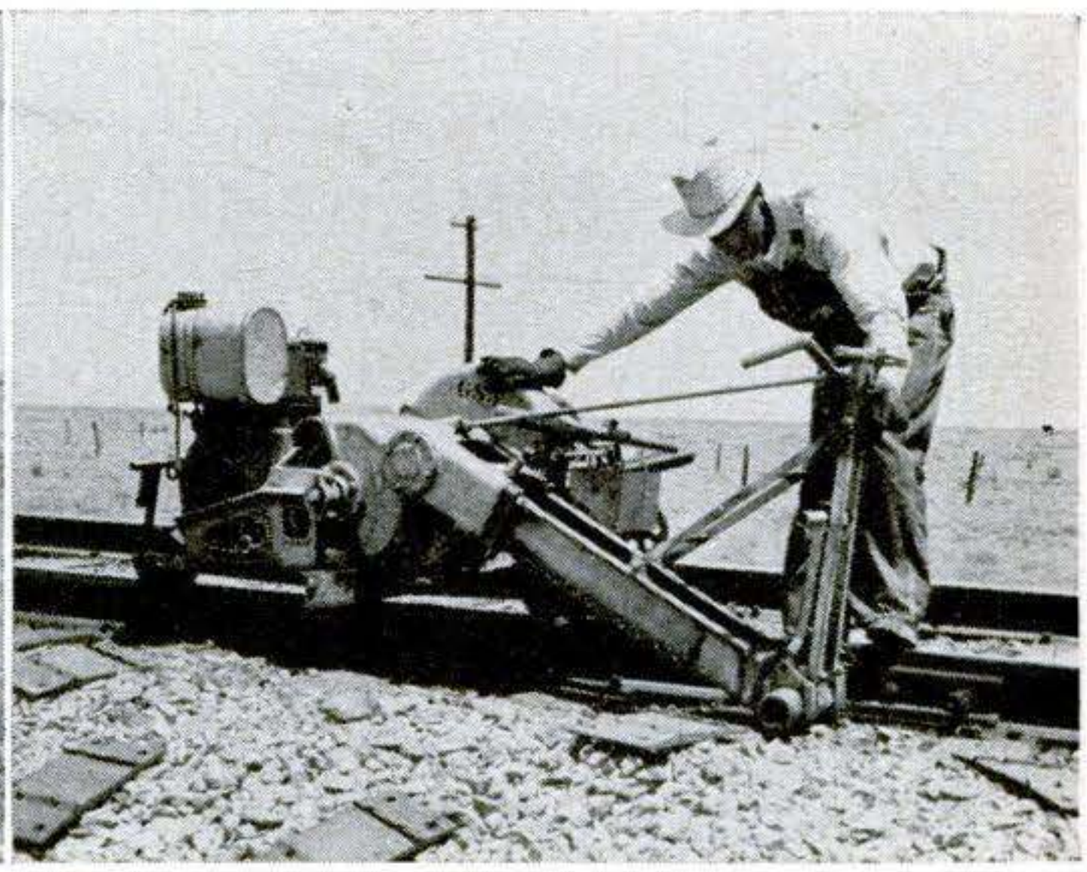
Today fast-moving power tools do everything from cutting weeds to cleaning up after earthquakes —and most don't even ride on rails.



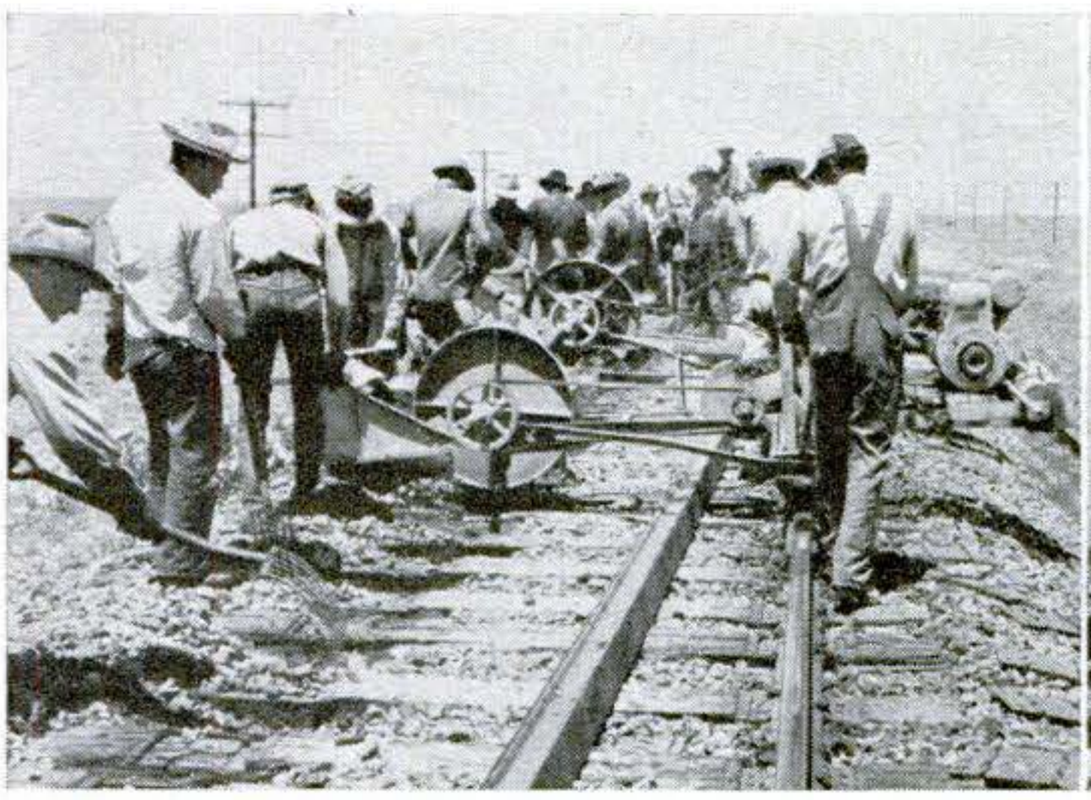
LARGEST of all track machines is this ballast cleaner, which scoops up the stone on either side of the ties, screens it and carries the dirt back to a string of hopper cars.



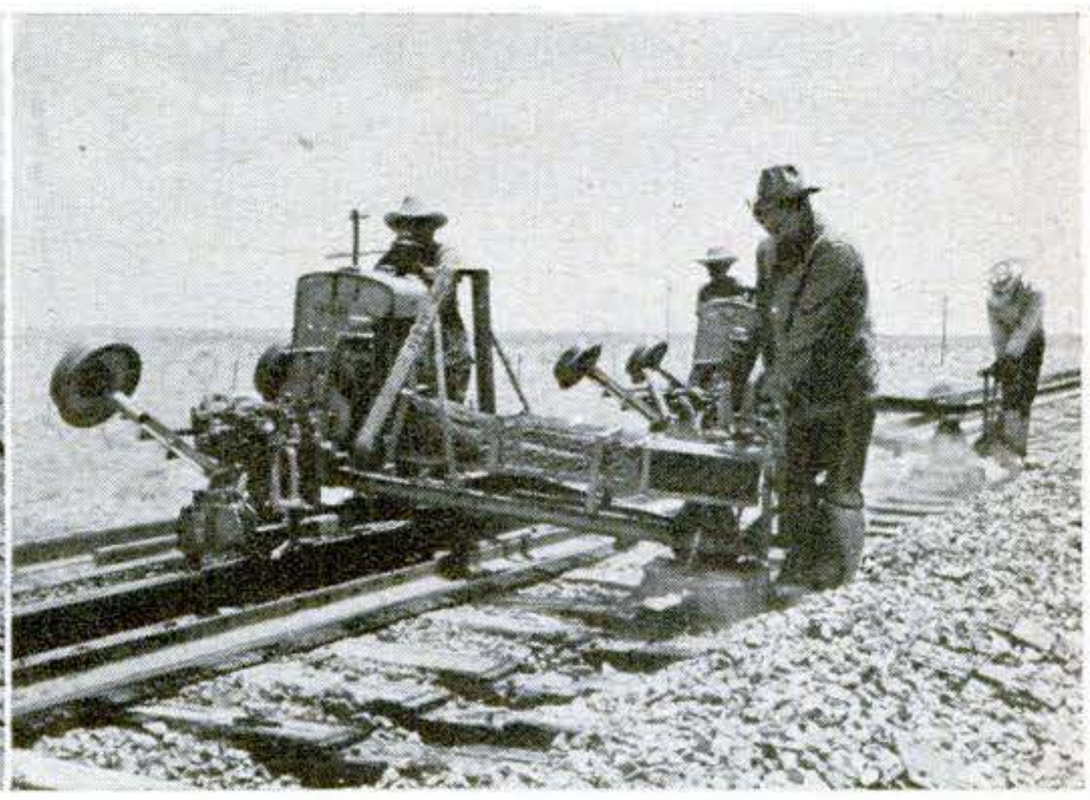
SEATING TIES in ballast is a cinch for the mechanical tampers used on the Santa Fe. Compressed-air hammers compact the stone to right and left of the rails.



STRONG AS A DOZEN MEN, this gasoline-powered wrench loosens the splice-bar nuts when rails must be removed. It easily breaks bonds that would make the gandy dancers sweat.



WHEN NEW AND HEAVIER RAIL is laid, cribbing between the ties is removed with rotary spades, preventing damage to the mechanical adzers which shave down the ties.



SPINNING ADZER BLADES level a broad base for the rails. After the raw wood has been creosoted, big steel tie plates are applied to spread out the weight of heavy trains.

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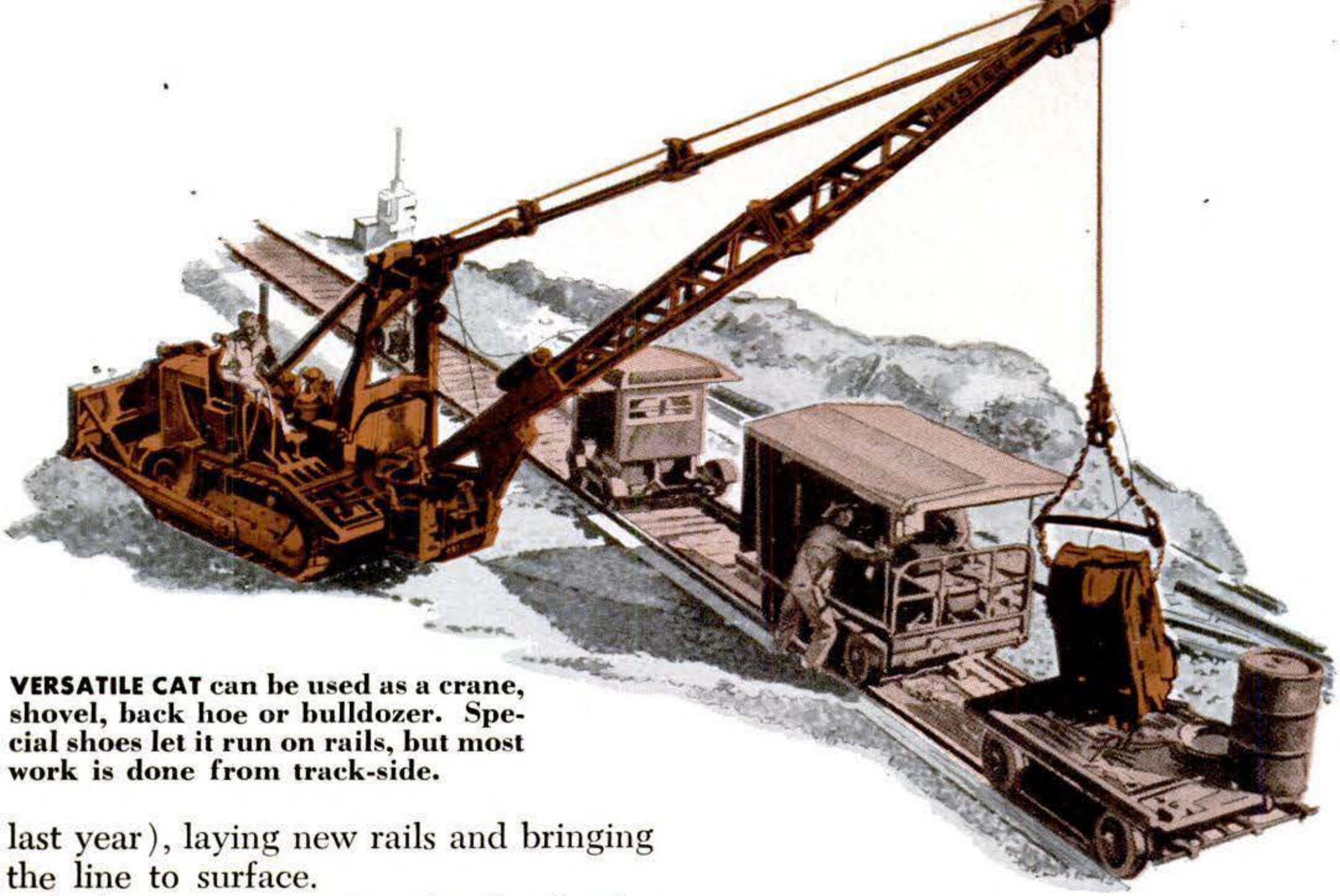


VERSATILE CAT can be used as a crane, shovel, back hoe or bulldozer. Special shoes let it run on rails, but most work is done from track-side.

last year), laying new rails and bringing the line to surface.

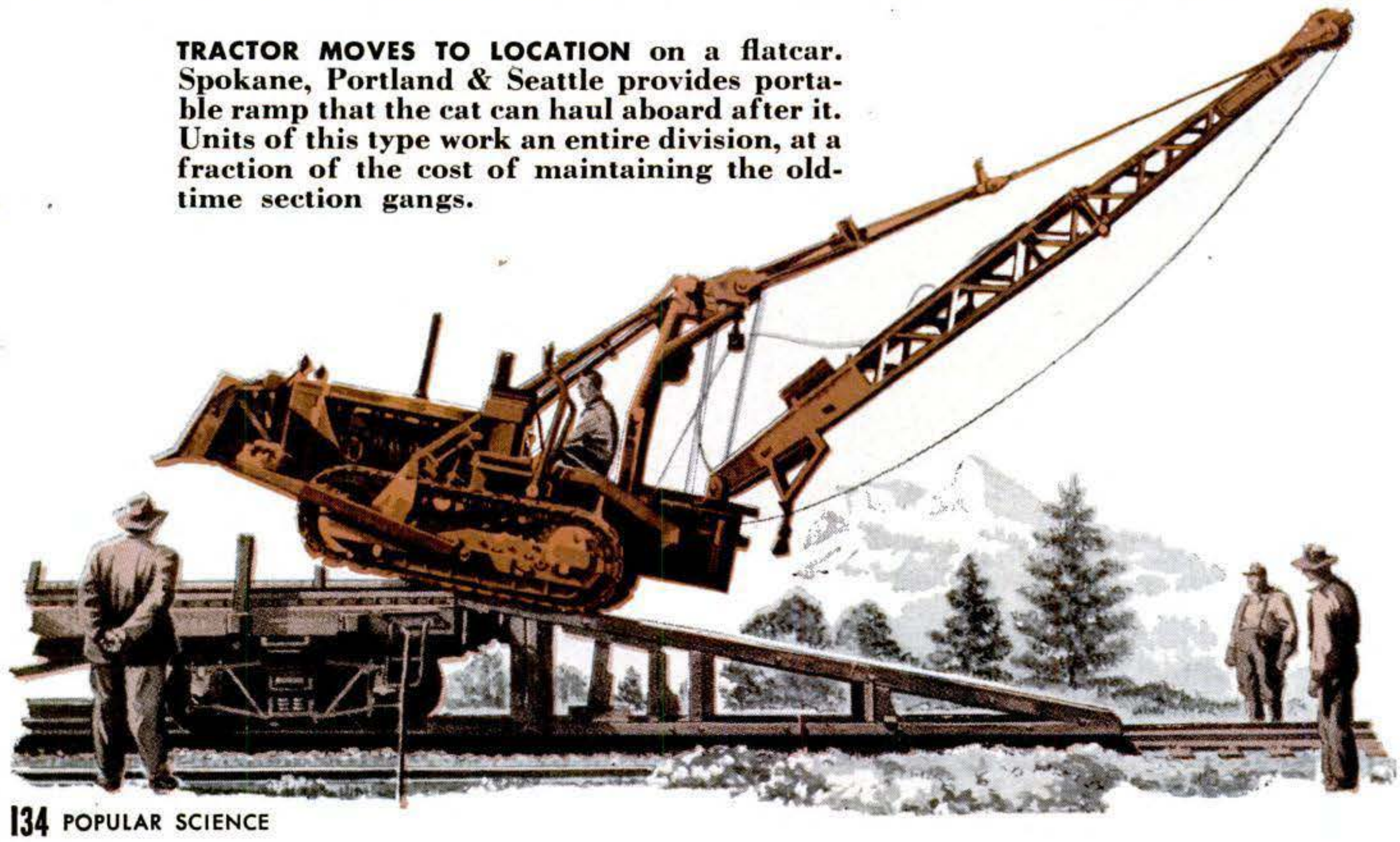
Such a crew, reports the St. Louis–San Francisco Lines, does a better job in far less time. Like other roads which have switched to district maintenance, the Frisco hauls its gangs to and from each job in two-ton trucks, eliminating delays to trains and offering employees a chance to go home after each day's work.

Most of the men are specialists. Like the signalmen, painters, masons, carpenters and steelworkers who help them to keep up 397,000 miles of American track at an annual cost of $1,500,000,000, their job calls for training and ability. Less than half of today's 251,000 maintenance workers are pick-and-shovel artists.

Like the gangs which use them, modern track-repair machines are highly specialized. Less and less equipment runs on rails. In 1952, Class 1 railroads spent $19,500,000 on 9,700 road repair units. These included more than 2,000 self-propelled, off-track machines, ranging from trucks to bulldozers.

Rigs like this really pay off in flexibil-

TRACTOR MOVES TO LOCATION on a flatcar. Spokane, Portland & Seattle provides portable ramp that the cat can haul aboard after it. Units of this type work an entire division, at a fraction of the cost of maintaining the old-time section gangs.



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DITCHING and dragline operations call for a two-man crew. Cat also handles rails and ties with ease, replaces bridge timbers, and sets up stockpiles at remote points where regular cranes are not available.

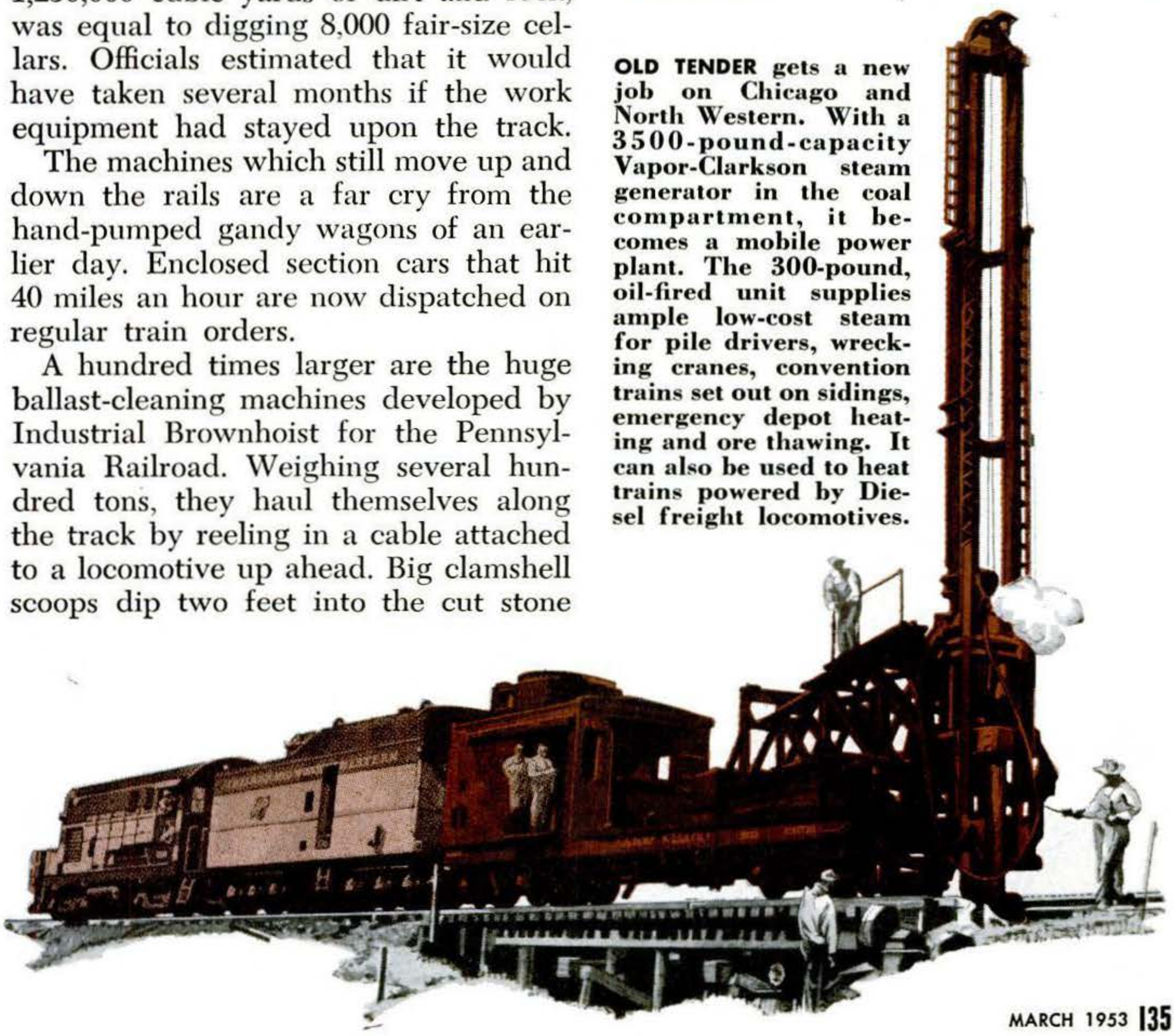
ity. Just 24 hours after last summer's Tehachapi earthquake wrecked 11 miles of Southern Pacific track, shattering eight tunnels and collapsing half a dozen giant fills, the road rushed 175 heavy earth-moving units to the scene. The big cats, scrapers and pneumatic-tired cranes day-lighted the shorter tunnels and ran shoo-flys around the long ones in exactly 25 days. This plastic surgery job, involving 1,250,000 cubic yards of dirt and rock, was equal to digging 8,000 fair-size cellars. Officials estimated that it would have taken several months if the work equipment had stayed upon the track.

The machines which still move up and down the rails are a far cry from the hand-pumped gandy wagons of an earlier day. Enclosed section cars that hit 40 miles an hour are now dispatched on regular train orders.

A hundred times larger are the huge ballast-cleaning machines developed by Industrial Brownhoist for the Pennsylvania Railroad. Weighing several hundred tons, they haul themselves along the track by reeling in a cable attached to a locomotive up ahead. Big clamshell scoops dip two feet into the cut stone and gravel, hoist it onto a series of screens, shake out the dirt and replace the ballast some 50 feet down-track.

Cleaning several miles of roadway a day, such machines may not be as spectacular as a 6,000-horsepower Diesel locomotive. But they are just as important, for no train is faster—or safer—than its track. END

OLD TENDER gets a new job on Chicago and North Western. With a 3500-pound-capacity Vapor-Clarkson steam generator in the coal compartment, it becomes a mobile power plant. The 300-pound, oil-fired unit supplies ample low-cost steam for pile drivers, wrecking cranes, convention trains set out on sidings, emergency depot heating and ore thawing. It can also be used to heat trains powered by Diesel freight locomotives.



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"Hypo" Speeds Mountain Mail

THIS big bus-and-trailer takes over the mail where the railroad leaves off. One of a nationwide fleet of similar vehicles, it makes pickups and deliveries to small towns not covered by railway mail service, running between Asheville, N. C., and Blue Ridge, Ga. In the last 12 years the highway postal system of which it is a part has grown from a single run to 75 regular routes in 26 states.

Leaving Asheville daily at 5:10 a.m., the rolling post office heads toward Candler, first stop on its winding route southwestward through the North Carolina mountains. By lunch time it has reached the Blue Ridge terminus, having delivered the mail to 23 towns and stopped twice at crossroads to transfer mail to a waiting truck for distribution to isolated communities. Then the highway post office turns around and retraces its route, picking up outgoing mail along the way.

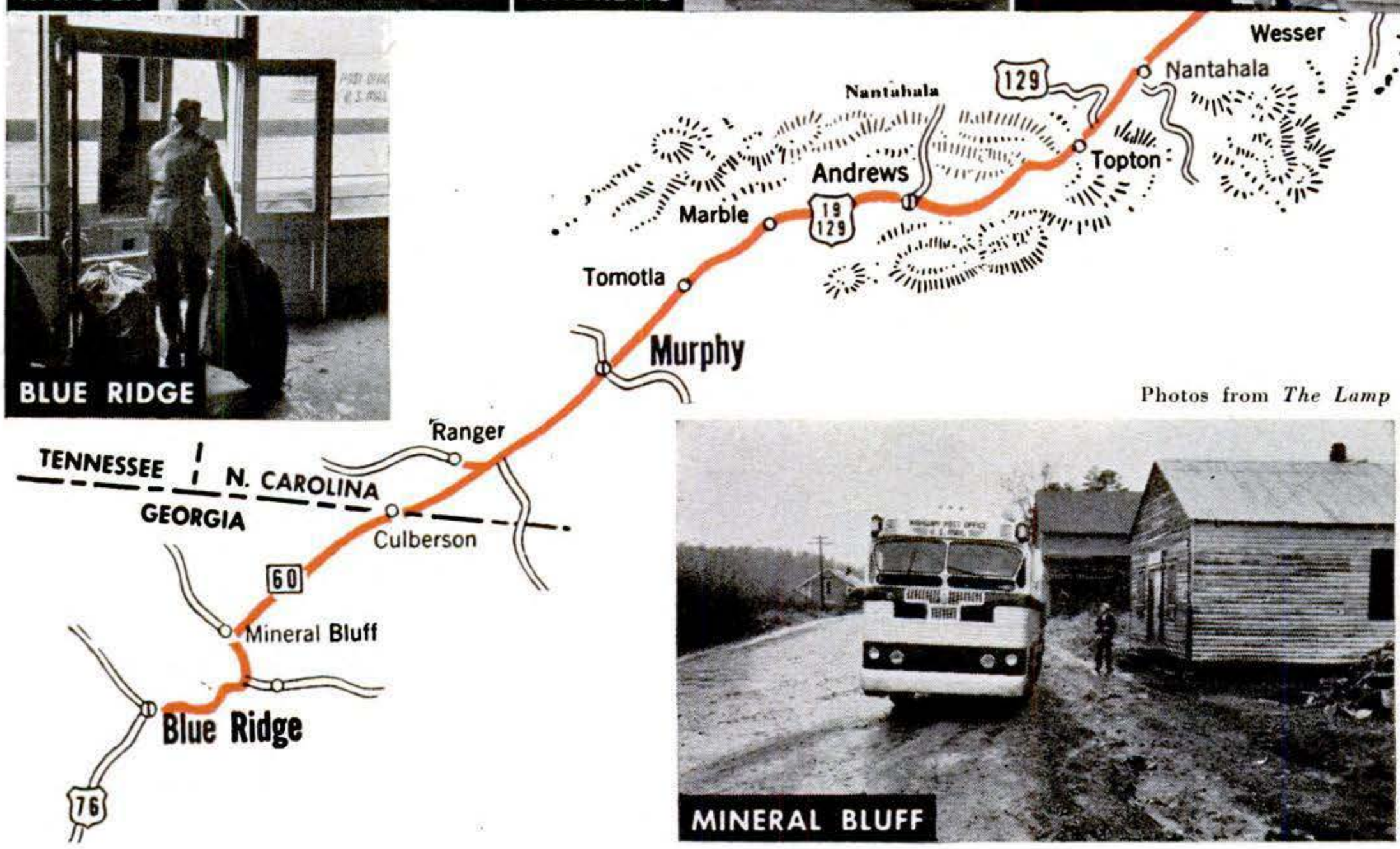
MURPHY

RANGER

ANDREWS

NANTAHALA

BLUE RIDGE



Photos from *The Lamp*

MINERAL BLUFF

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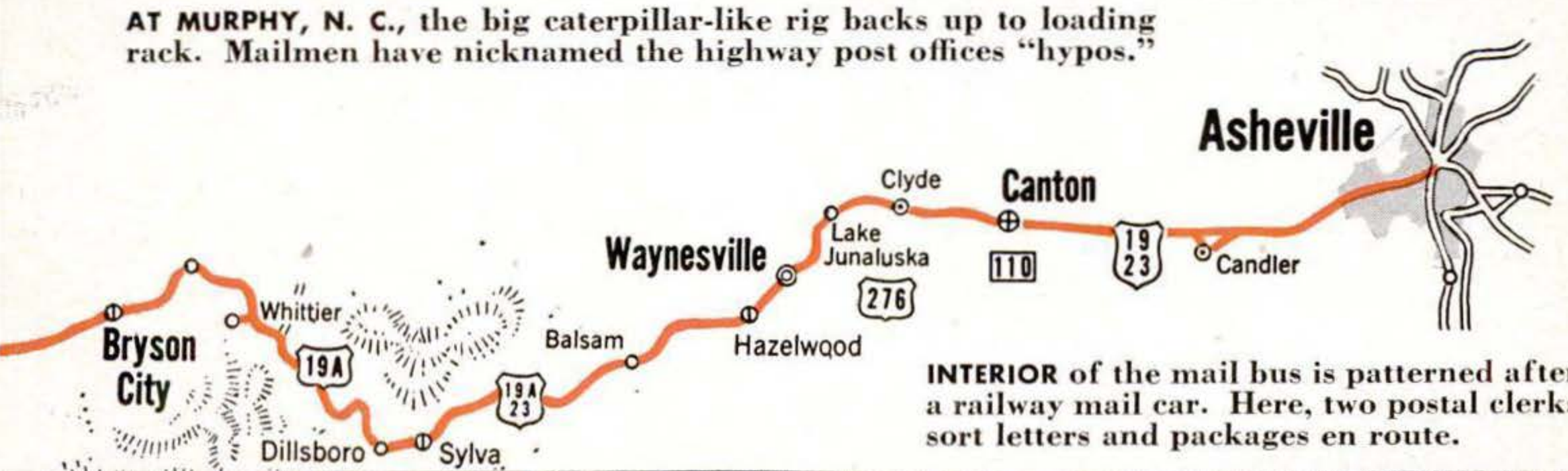
AT MURPHY, N. C., the big caterpillar-like rig backs up to loading rack. Mailmen have nicknamed the highway post offices "hypos."



INTERIOR of the mail bus is patterned after a railway mail car. Here, two postal clerks sort letters and packages en route.

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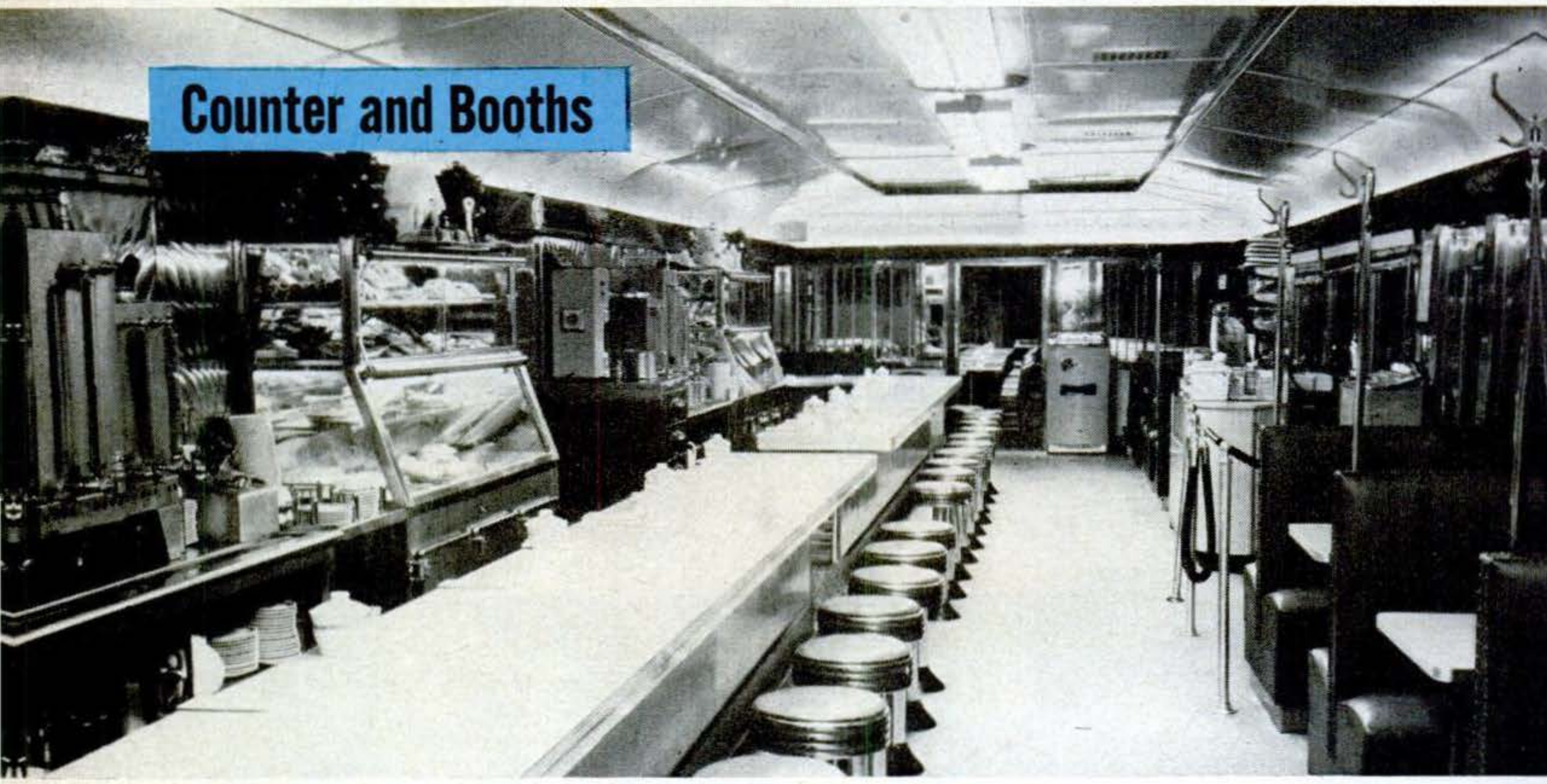
World's Fanciest Diner

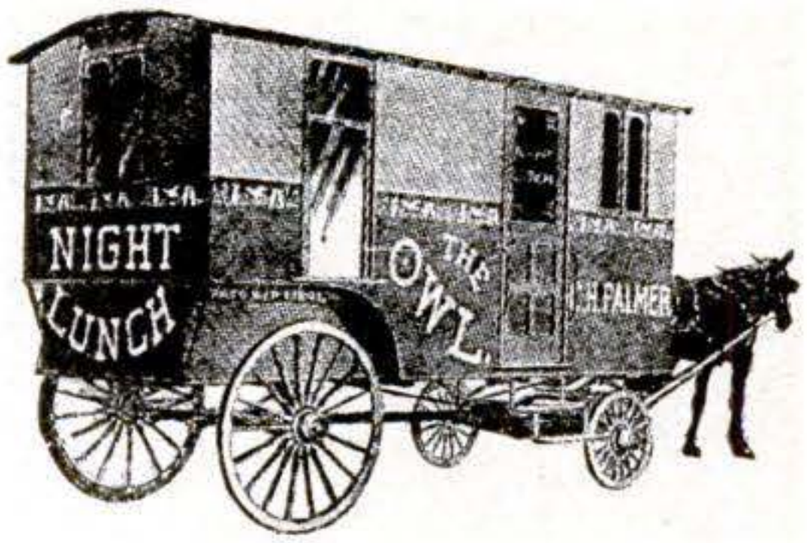
THE TITLEHOLDER, whose claims to its fame are displayed below, stands in Providence, R. I. It was selected by Jerry O'Mahony, Inc., world's biggest builder of diners.

Counter and Booths



Dining Room

The Old Dog Wagon Puts on the Dog



It started out as a humble imitator of the swanky dining car, but now its menus and marvels have made it into a roadside Ritz.

By Gardner B. Soule

THE eating places with the most elaborate menus in the world, the fastest service and the most customers are not the restaurants of Paris but instead are mass-produced in U. S. plants.

The roadside diner—the long, narrow, silver-colored affair that looks like a railroad dining car—has become the fanciest, speediest and busiest of eating establishments.

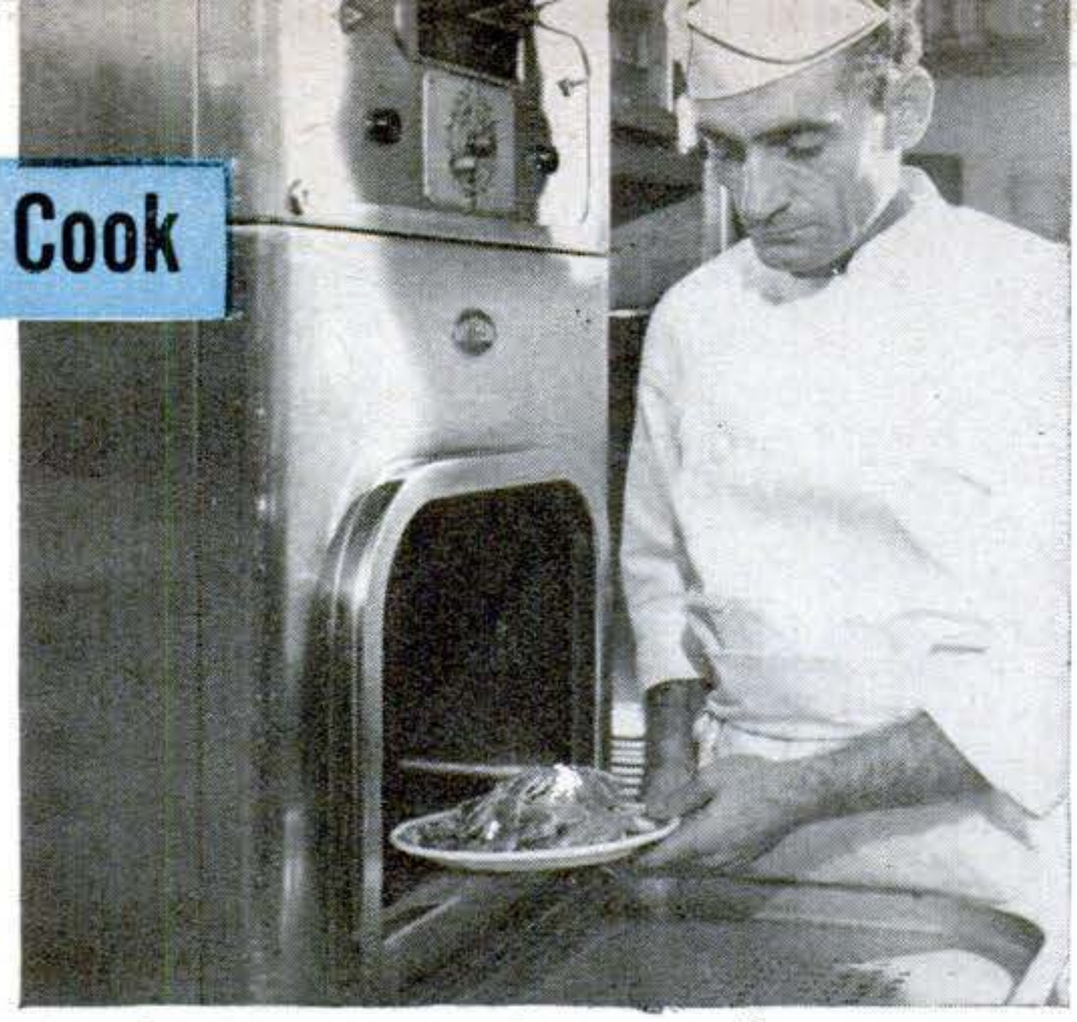
The story begins more than 60 years ago, in 1892, the year Charles Duryea successfully operated the first gasoline-driven horseless carriage in America. In that year a man named Charles Palmer started using horse-drawn wagons to carry hot frankfurters and beans to workmen in Worcester, Mass., factories.

What grew out of Duryea's invention is well known. What came from Palmer's idea is not. But as Americans took to the highways, the diner took out after the cars, and by 1953 the diner was as different from Palmer's dog-and-bean wagon as a 1953 Cadillac is from Duryea's gasoline buggy:

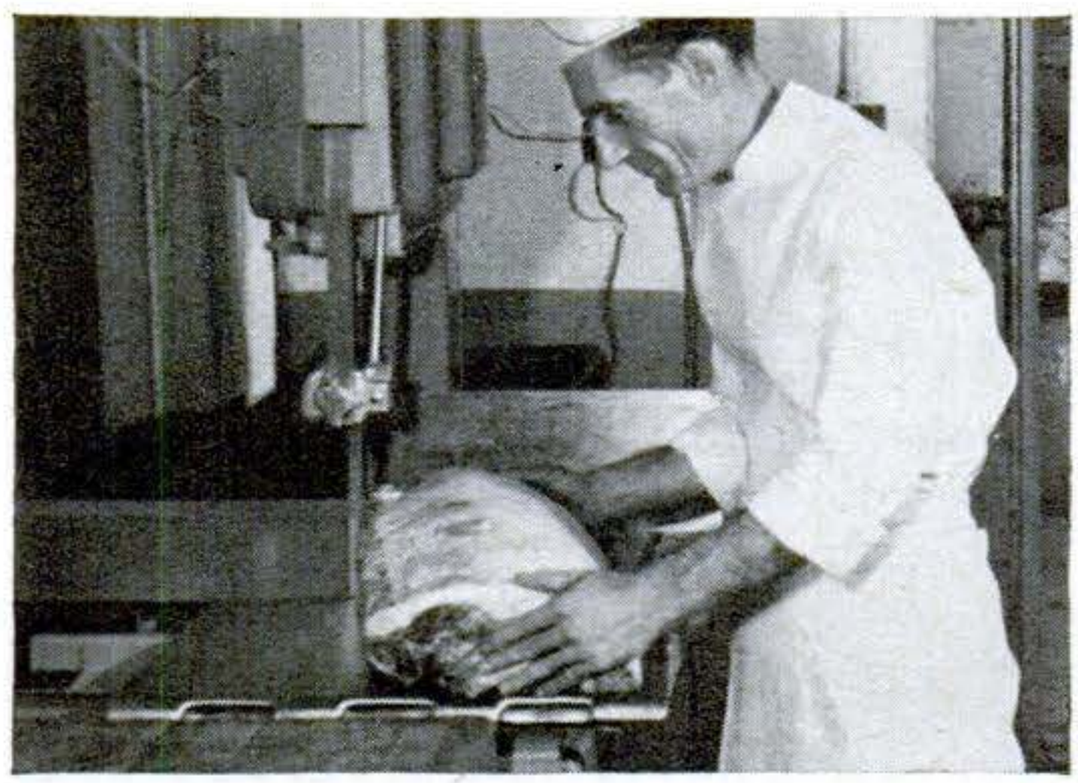
- Instead of Palmer's menu of two choices, the 1953 diner has a menu that may run to six pages and include lobster Cantonese, crêpes Suzette and champagne.
- Instead of taking the time that the

Science Aids the Short-Order Cook

FROZEN ASSETS of the lavish diner on the previous pages are the meats and poultry kept on hand in this spacious walk-in refrigerator.



QUICK, THOROUGH COOKING for customers who normally spend only 20 minutes eating is guaranteed in the speedy radar range.



ELECTRIC MEAT CUTTERS slice through a side of beef with ease and save valuable time in preparing food for a fast-moving crowd.

Greasy Spoon used to require to prepare a meal, the 1953 diner is engineered to get the average customer in, fed and out in 20 minutes.

• Instead of peddling food to workmen only, the 1953 diner caters to men, women and children, even to clubs. It caters to truck drivers still (although the tip-off to a diner's popularity is no longer rows of Fruehaufs but a parking lot full of Fords, Buicks—and up). It caters, above all, to families.

• Instead of functioning at night only (this got Charles Palmer suspected as the operator of a sinister trade), the modern diner is open 24 hours a day. "We don't have a key," says Martin Rich, who owns a diner near Port Chester, N. Y., on U. S. 1. "I forgot where I put it."

• Instead of being an establishment of doubtful hygiene, the 1953 diner has steel counters, leather or plastic seat covers, terrazzo floors, chrome decorations and a plastic ceiling. All—including the ceiling—can be wiped clean instantly with a damp cloth.

• Instead of seating six or eight persons at a counter only, as Palmer's wagons did, the modern diner has tables, booths *and* counters, and seats as many as 137.

• Instead of being carpenter-built wooden wagons, today's diners are stainless-steel, chromium-plated, air-conditioned, fully insulated, fluorescent-lighted, de luxe eating establishments with as many accessories as a 1953 automobile. They are constructed on assembly lines with power tools, largely from prefabricated parts.

The man who changed the wooden

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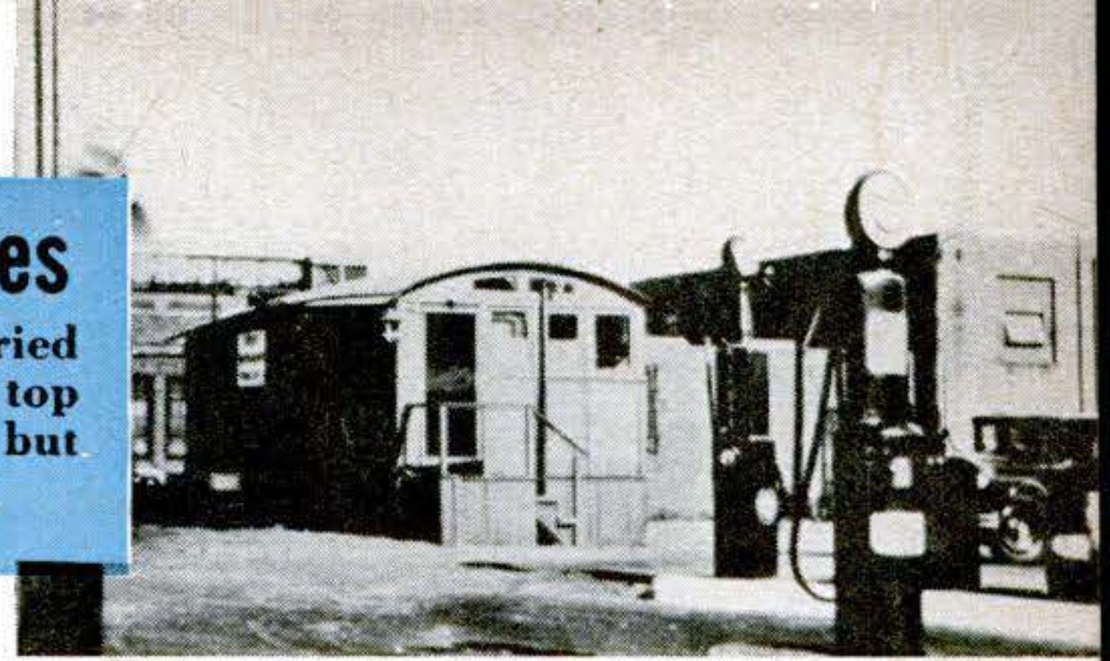
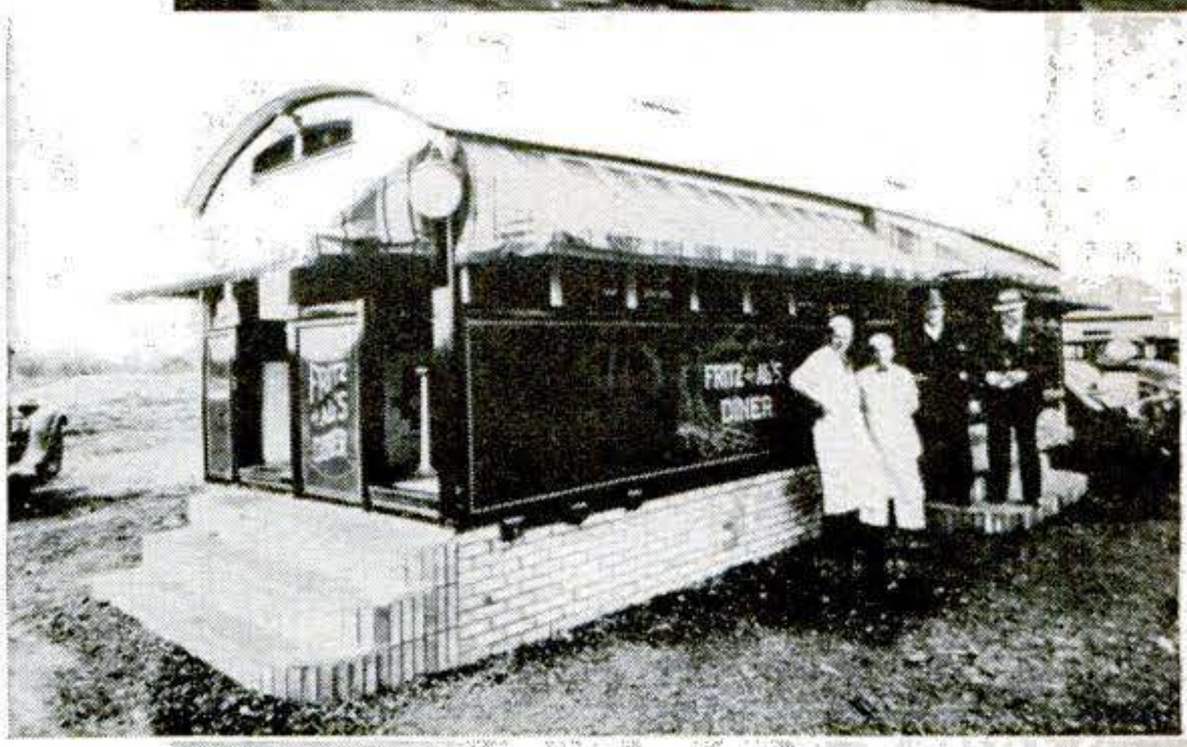
One Diner's Rise from Rags to Riches

FRITZ HAS FLOURISHED in the 20 years since he fried eggs in the crude Trenton, N. J., diner in the top photo at right. His location hasn't shifted far, but his business has obviously come a long way.



lunch wagon into a streamlined steel car was a New Yorker named Jerry O'Mahony. He ran a diner at 7th Avenue and 34th Street in 1913. Did well, too. Made $1,380 that year. But customers asked where he got his wooden diner. So he had his carpenter build some, and sold them for $300 each. Then he kept on building diners.

Today Jerry O'Mahony, Inc. of Elizabeth, N. J., is the biggest of about a dozen companies making diners. Others include Silk City Diner, Inc., and Paramount Diner Corp. at Paterson, N. J. and Kullman Dining Car Co. at Harrison, N. J. New Jersey is the state that makes the diners.



Prices Have Gone Up

O'Mahony's prices have gone up. "Our diners," the company boasts, "are the most expensive you can buy." Selling prices start at $36,000 (34 seats) and go up to $110,000 (those 137-seaters).

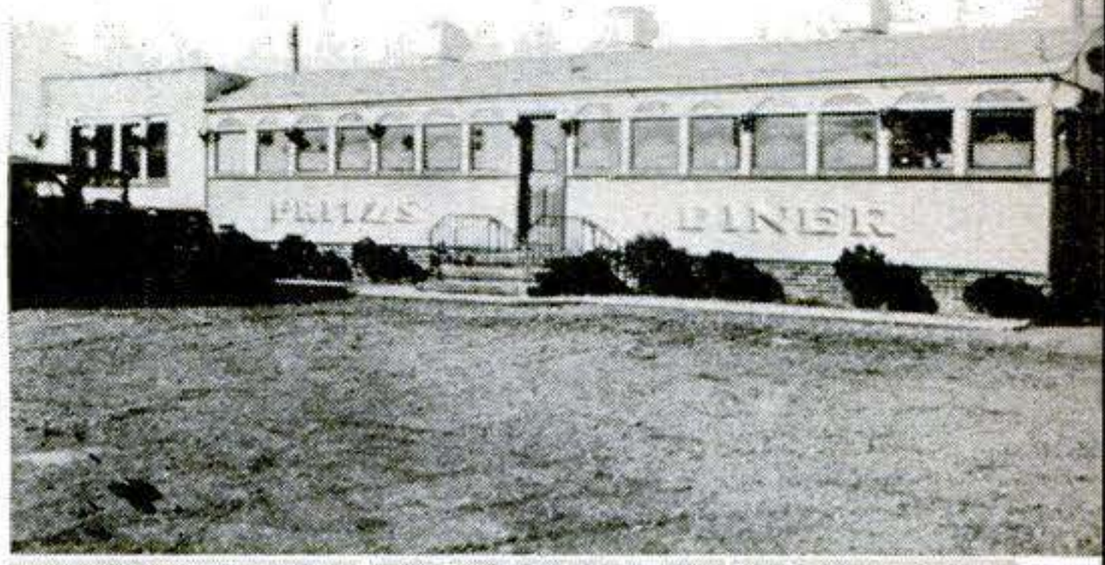
An O'Mahony diner is delivered to its owner complete: with sinks, stoves, refrigerators, walk-in freezers (a diner buys a side of beef at once), plumbing, air conditioning, heating, automatic dishwashers, steam tables, phone booths, counters, stools, pots, pans, waitresses' uniforms, china, napkins, silverware, toothpicks, rest rooms, fudge pumps, food warmers, and juke-box outlets offering a choice of up to 100 records.

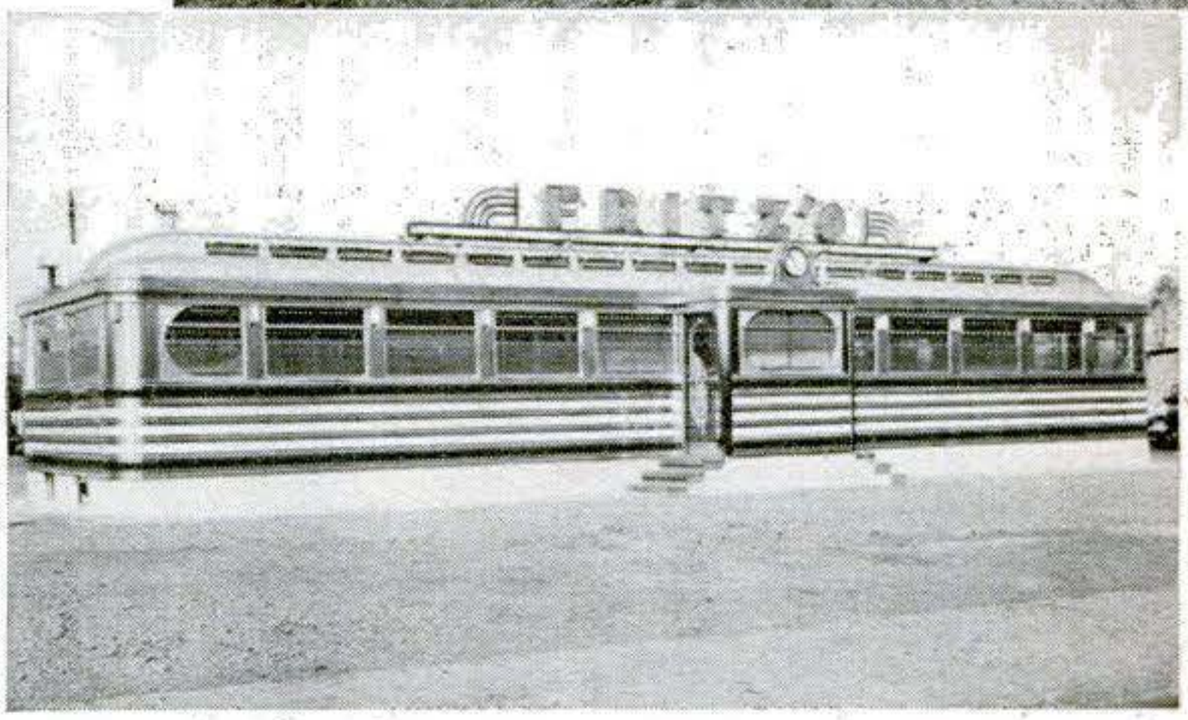
O'Mahony will include television sets if you insist, but doesn't like to. TV keeps the customers staying longer than that 20 minutes without increasing the money they spend.

Some O'Mahony diners come with a private mahogany office for the owner, complete with built-in shower.

The prospective owner usually pays

[Continued on page 248]





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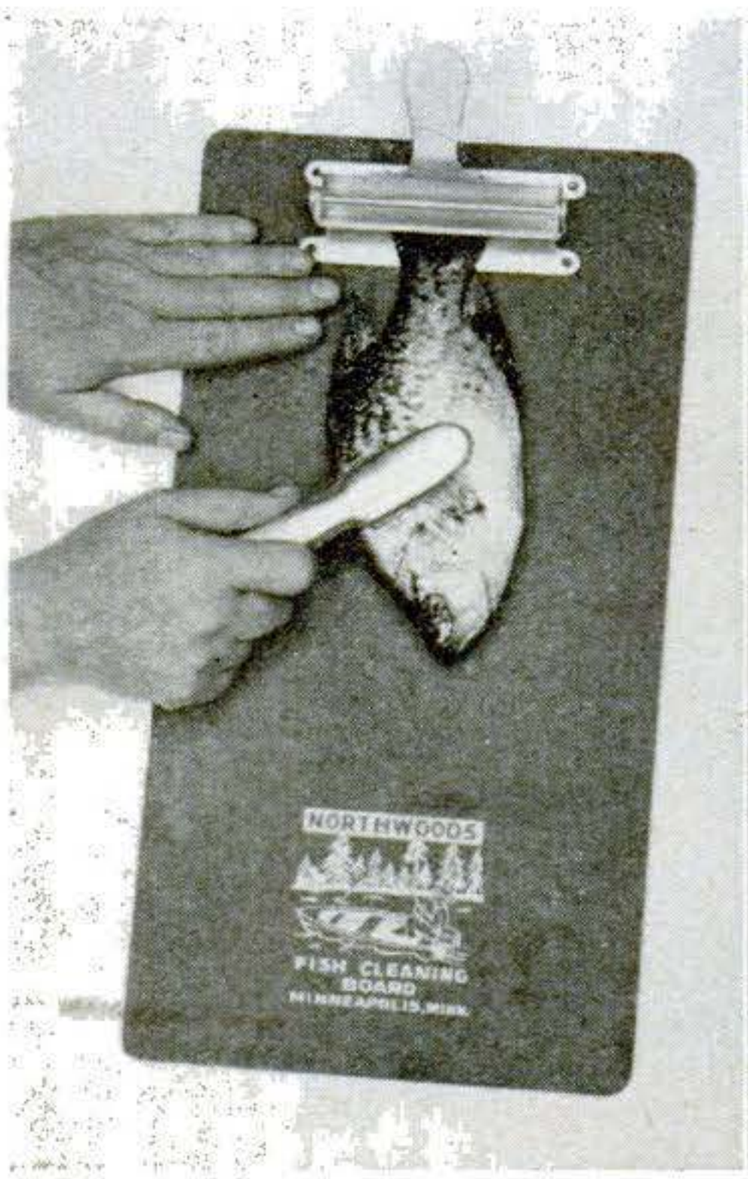
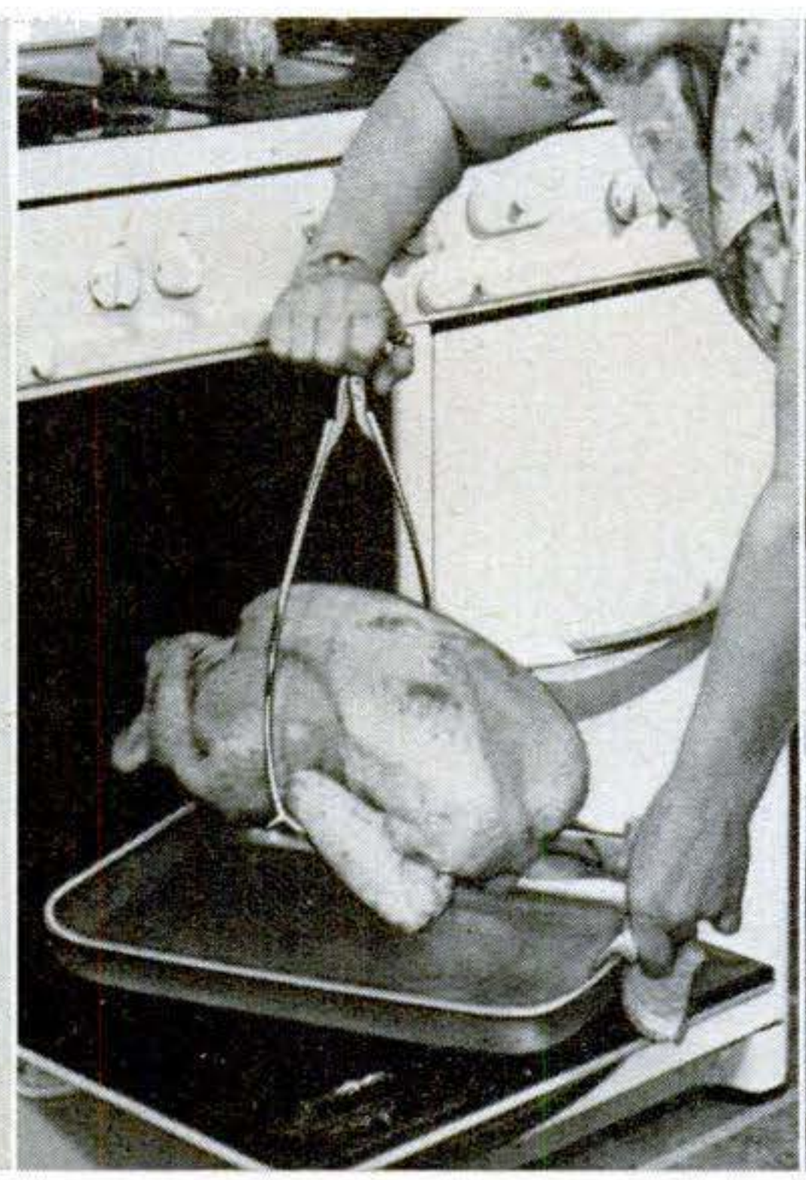
New Tools for Big Eaters

1. Mechanical shucker makes oysters on the half-shell no chore at all. With the one at right, you set the oyster in place between two jaws and push down easily on the lever. The oyster is not pried open, but pops apart as a sliding, twisting action severs the muscle from the shell.



4. Fish board makes cleaning, scaling and steaking fish easier. A steel clamp on the 18-inch board grips a fish by the tail. Both your hands are free to do a job on the slippery catch and they take less of a beating from the scales since the fish never skids around while you work.



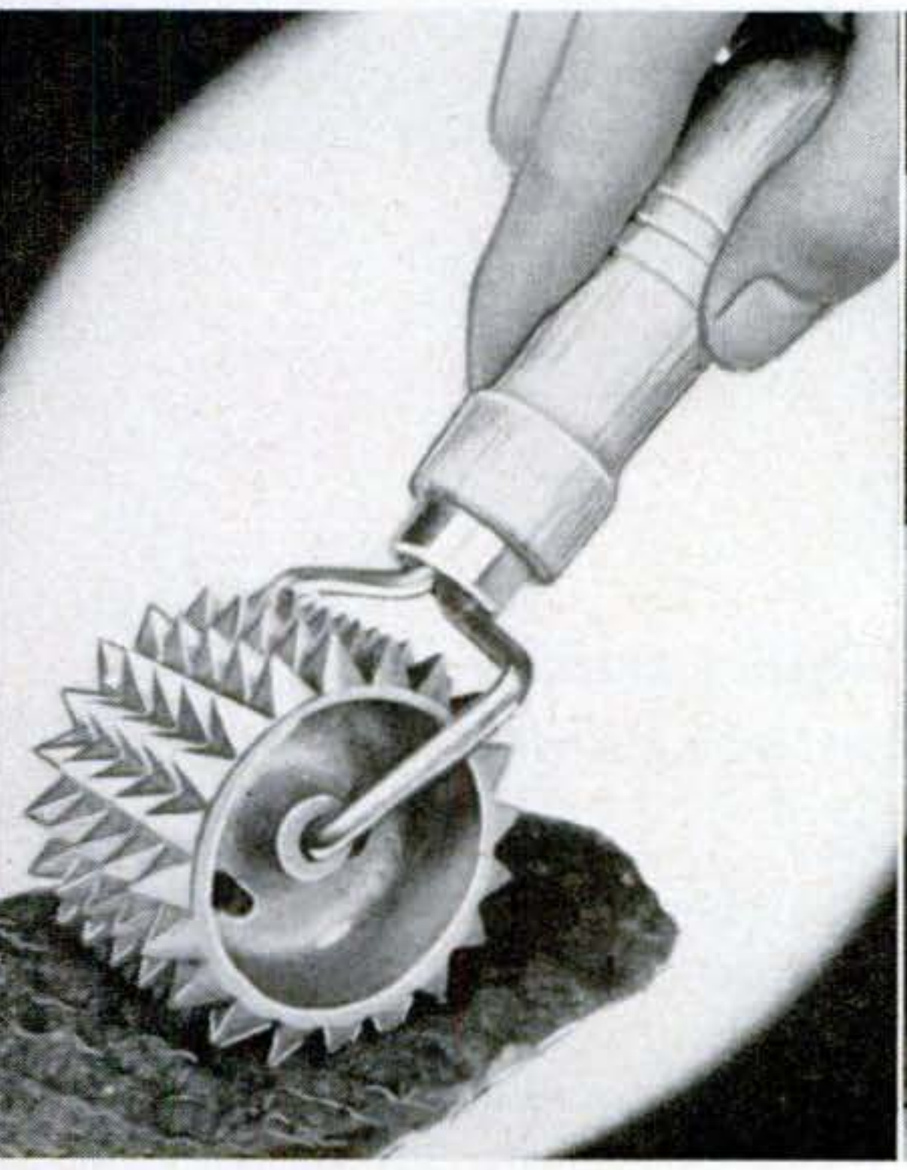
5. Steel tongs, like those the iceman used to carry, let a cook lift a heavy bird with ease. The transfer from pan to platter can be made with no assist from the man of the house. Called the Lift-A-Roast, the tool is just right for reaching into a deep electric roaster.

6. Most used tool of professional meat chefs is the thermometer. Here's one with an easy-to-read temperature dial that brings roast beef to your table the exact shade of pink you hunger for. A chart on the porcelain-enamel face gives temperatures for cooking meat as you like it.

Copyrighted material

2. Meat rack spears a roast on four upright prongs to hold it steady for the carver. The joint can't slide or wobble, is always in perfect position for slicing.

3. Injector stuffs meats with bits of pineapple, mushrooms, onion, spices; permeates roasts with wine, honey or meat juices. The Flavor-Maker is also a larding needle and stitching needle.



7. Tenderizer makes Swiss steak seem more like porterhouse. Rolled over cheaper cuts of meat, it breaks up tough fibers. Twenty columns of sharp teeth—set five abreast—do the job.

8. Pattie Paddle will stack up the hamburgers fast to take care of a crowd at the dining table or the outdoor barbecue. Once filled, the plastic shaper is upended and the pivoted bottom is slid to one side so that the burger plops into the pan or onto the griddle without sticking. It holds two ounces when packed level and will turn out fish patties or potato cakes for non-burger fans.

Further information on these products can be obtained from: 1. Shuck 'Em, Inc., 152 Beekman St., NYC; 2. Maxwell-Phillip Co., 225 Fifth Ave., NYC; 3. Bard's Products, 81 Salem Lane, Evanston, Ill.; 4. Central Mfg. Co., 1824 4th Ave. So., Minneapolis; 5. Dudley Kebow, Inc., 5941 Avalon Blvd., Los Angeles; 6. Cooper Thermometer Co., Pequabuck, Conn.; 7. Miles Kimball Co., 44 Bond St., Oshkosh, Wis.; 8. Specialty Mfg. Co., Box 871, Madison Sq. Sta., Grand Rapids, Mich.

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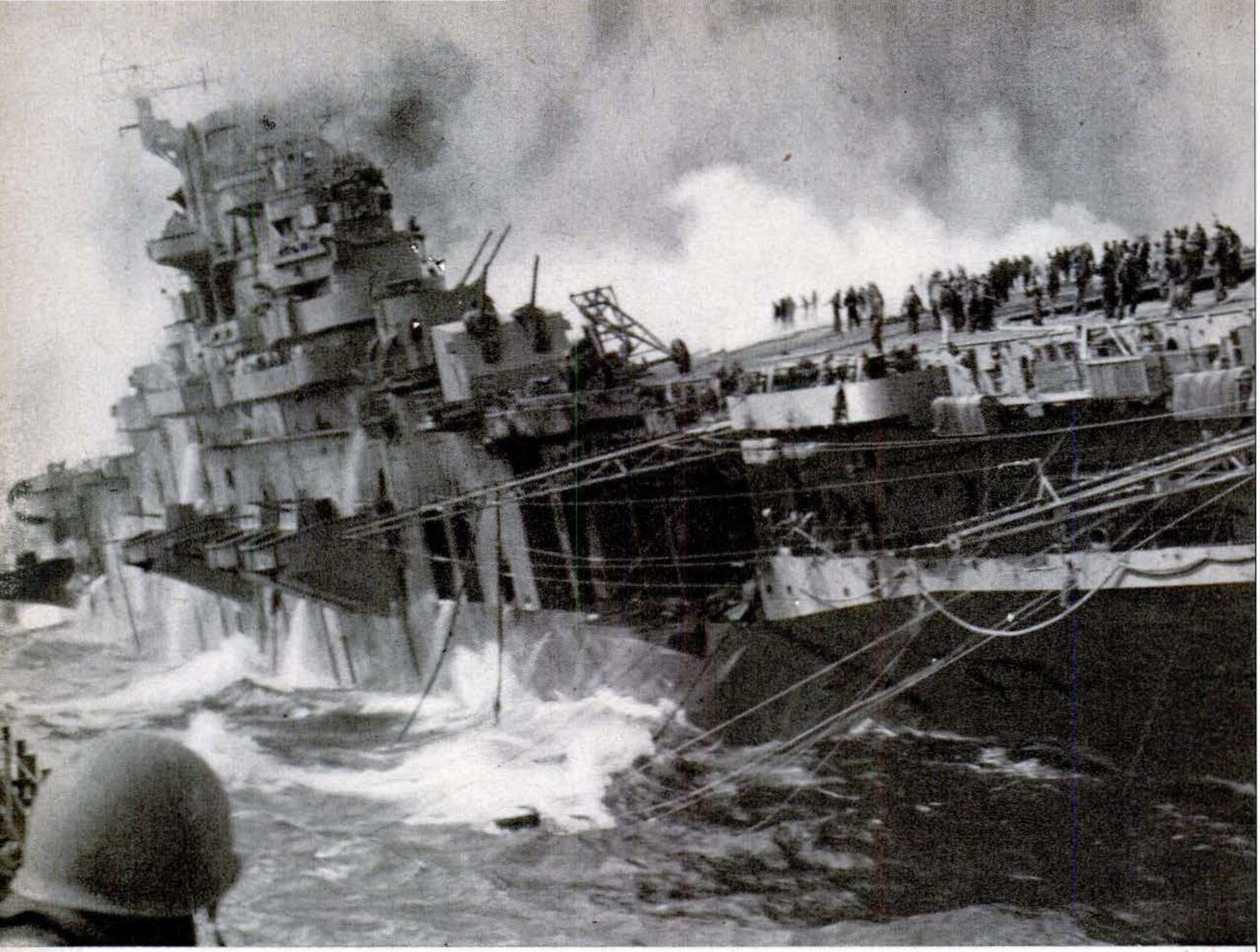

Navy Soup Guns

In crash fires seconds save lives. But the new Squirt trucks can spray foam fast enough to smother flames in time.

By Herbert O. Johansen

EARLY on the morning of March 19, 1945, a lone Jap dive bomber scored two hits on the USS *Franklin,* turning the big aircraft carrier into an inferno of flaming gasoline. Before the blaze was under control, hours later, more than 800 men had been killed and every plane on the ship had been destroyed. But four jeeps that had been used to haul aircraft on the deck came through unscathed.

If those jeeps had been Little Squirts, the newest weapon for fighting fire aboard aircraft carriers, the *Franklin* disaster would have been less devastating, say Navy damage-control experts. Had the new type of foam developed for use in this jeep fire wagon been available in World War II, many ships lost or disabled by fire could have continued to fight.

In demonstrating its baby recently, the Navy pointed out that the Little Squirt could protect small civil airports that can't afford $30,000-and-up fire trucks. A civilian version, the Navy estimates, should cost about $5,000—and an

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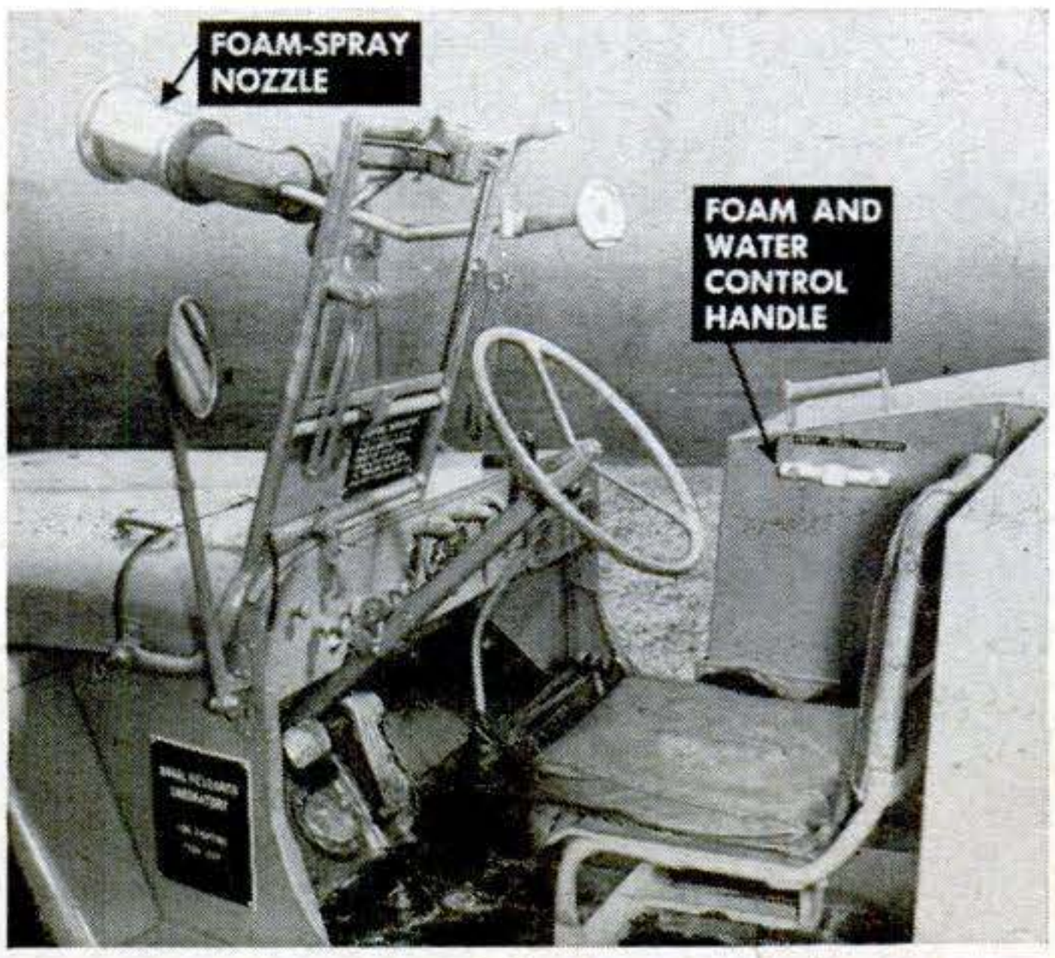
MARCH 19, 1945: Two Jap bombs struck USS *Franklin*, igniting the aircraft carrier's own gasoline tanks and exploding bombs, causing fire that destroyed every plane, killed more than 800, injured almost 300 and put the ship out of commission.

Fight Plane Fires

LITTLE SQUIRT is the Navy's new jeep fire-fighting wagon designed for use aboard large aircraft carriers. Spray pattern from the hand-operated, pivoted nozzle can be varied.

MICRO-BUBBLED FOAM sticking to boots of fireman shows how its fire-smothering blanket adheres even to vertical surfaces instead of running off as does old-type foam.



TO SHOOT STREAM of foam spray, driver puts jeep in neutral and engages power take-off. He then pulls foam-water handle and accelerates the engine to maximum speed.

BODY OF LITTLE SQUIRT is a tank with two compartments, one for 20 gallons of bean soup and another holding 230 gallons of water. These are fed by gravity into a pump.

auto manufacturer is planning to produce one.

The Little Squirt, and its Big Squirt brother, designed to fight big-bomber crash fires on land, were developed by chemists at the Naval Research Laboratory, Washington, D. C. They consider fire as a chemical triangle. Its three sides are fuel, heat and oxygen. Remove any one and you have the fire licked.

Knocking Out Oxygen Kills Fire

In crash fires, removing the fuel—mostly gasoline—is not practical. The same is true of heat. Water, considered the best cooling agent, cannot cool gasoline fires fast enough to permit occupants to be rescued. Also, gasoline, being lighter than water, may float and simply spread the fire. And high-pressure water streams have been known to cause magnesium in a plane to explode.

That leaves oxygen as the element to be tackled. It's done by blanketing a fire with chemicals. Carbon dioxide does a good job on small fires, especially in confined places such as engine nacelles. It's the stuff in those horn extinguishers you see near the engines while a plane's engines are being warmed up. But carbon dioxide blows away too quickly to have much effect when a whole airplane is enveloped in flames—and it is not usually available in large enough quantities.

Foam Blankets Flames

So the chemists have developed a blanketing foam. It not only removes the oxygen side of the fire triangle but prevents further vaporization of the gasoline. And it's the vapor that feeds the flames.

The secret of the Squirts is the new and better "bean soup" that they shoot from their "guns." The ingredients are the same—a foam concentrate of protein solutions (which looks like black-bean soup, has a foul smell and is sometimes made from soy beans), water and air.

It is how the ingredients get together that makes the difference—that and the proportions. Naval Research Lab chemists found that ordinary foam, effective on certain types of fires, was too fluid for

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CREW CHIEF ON BRIDGE

LOUDSPEAKERS

FOAM-SPRAY TURRETS

GROUND-SWEEP NOZZLES

BIG SQUIRT has foam-spraying capacity to blanket crash fires of large bombers on land. Tanks hold 80 gallons of foam concentrate and 1,250 gallons of water. The twin-turret sprays smothered a simulated airplane-crash fire (below) in less than two minutes.

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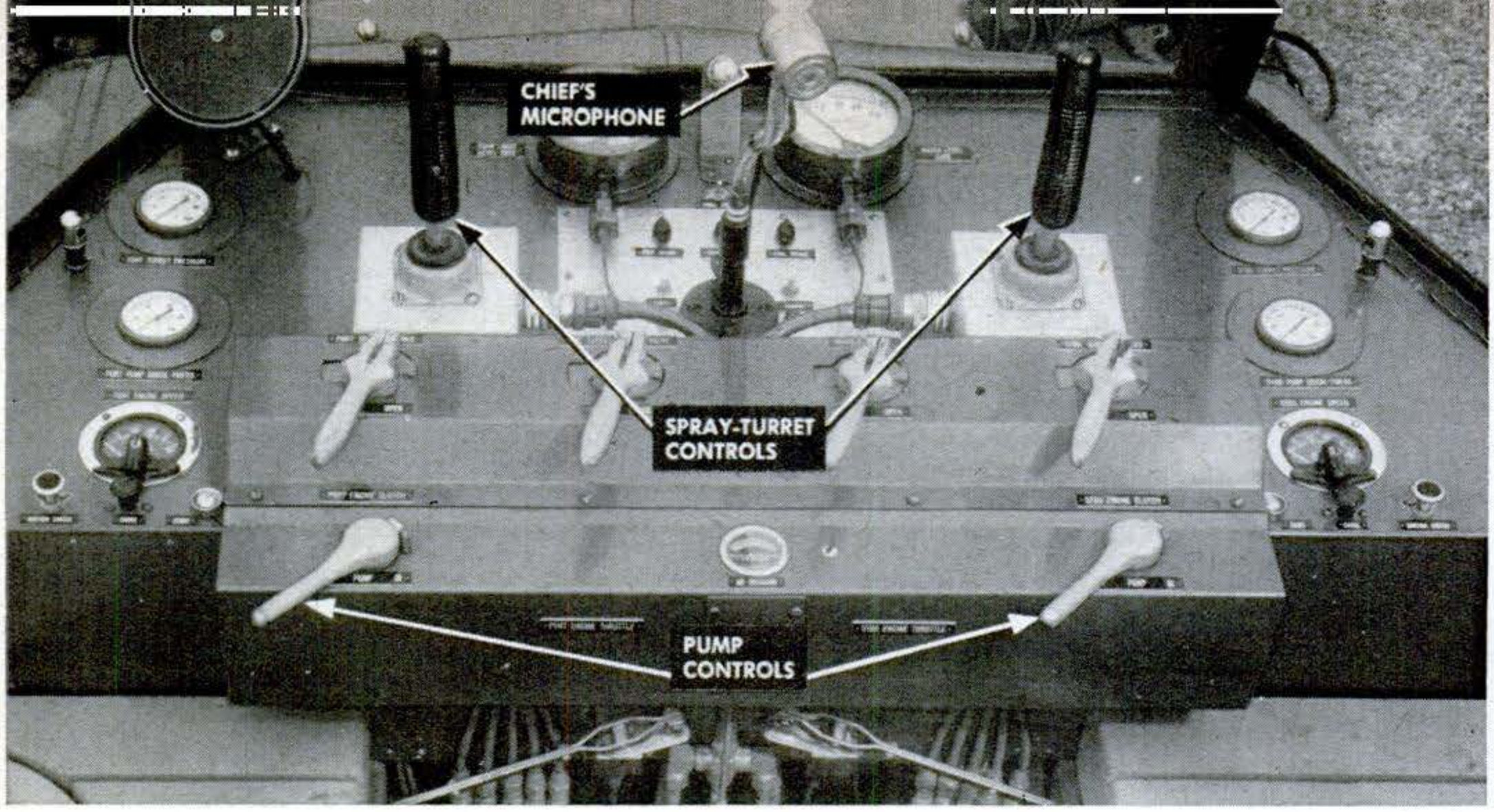


ALL FIRE-FIGHTING OPERATIONS are controlled from this "bridge" on top of the Big Squirt. Valves and clutches are air-operated; the spray-gun patterns are electrically controlled.

aircraft blazes. It just wouldn't stick where you wanted it. This foam usually is made by pumping the soup and water to a nozzle and mixing in air there.

The Squirts go about it differently. Soup and water flow by gravity from tanks into a pump which at the same time gulps air. Inside the pump, plastic paddles churn the ingredients to make a high-pressure, mechanical foam—the Navy calls it micro-bubbled—that is stiff and sticks where you shoot it, even on vertical surfaces. And it comes out in quantities two to three times greater than can be produced by similar equipment.

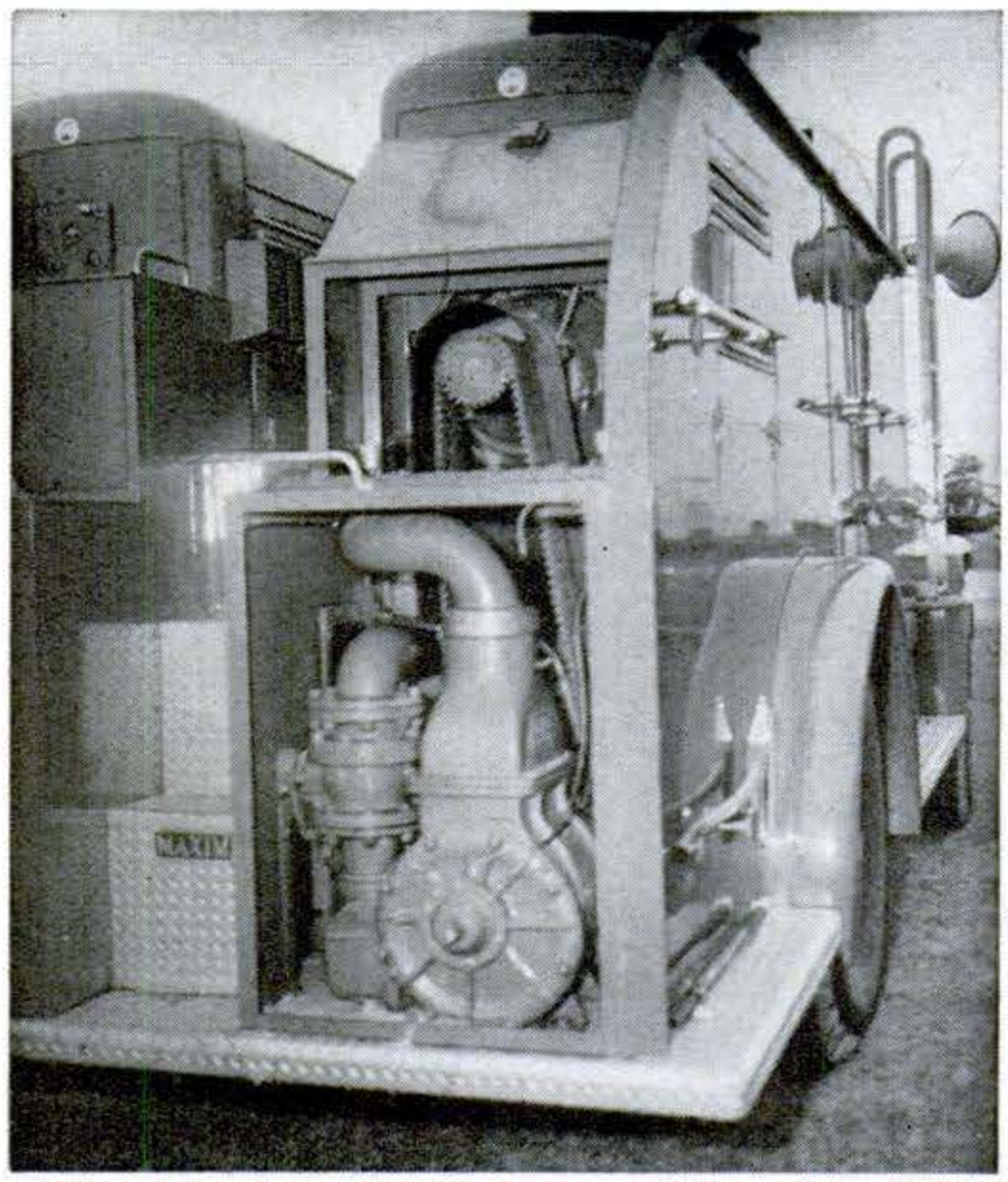
First a Rescue Path

The first thing the Squirts do when they dash into a blaze is to lay down a rescue path. There may be a wall of fire on either side, but the foam piles up and creates a safe exit way in a hurry. And in no other type of fire do seconds mean so much in saving lives.

In a simulated crash-fire rescue, with 150 gallons of gasoline blazing over 600 square feet, the Little Squirt laid down a rescue path within 24 seconds after its single nozzle began spreading a foam blanket. That was delivering about 1,300 gallons of foam a minute. The Big Squirt can throw more than 7,000 gallons a minute.

The Little Squirt is a standard jeep with dual rear wheels and a strengthened chassis. Power for the pump is taken off its 60-horsepower engine. The crew consists of the driver and a nozzleman. The latter can spray 1,300 gallons of foam a minute for more than two minutes. He can vary the spray pattern to reach a burning plane from 90 feet away or to cover a trapped pilot with a 30-foot-diam-

[Continued on page 258]



ONE OF TWIN PUMPS that churn the bean soup, water and air into new type of mechanical pressure foam. Each pump is chain-driven by a 140-horsepower engine.

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New Ideas

FROM THE INVENTORS

1 Corncobs to Avert Skids. Inexpensive winter-tire treads containing ground corncobs would outwear types that use sawdust, rock salt or steel wool, the inventor claims. The corncob particles (white dots in sectional view) would grip ice as the tread wears, both by projecting and by falling out and leaving suction cavities.

2 Spike to Flavor Meat. Filled with a seasoning liquid, this cooking aid would literally spike roasts with zestful aroma and flavor. It is intended to be stuck into the food. Its reservoir is so shaped that the fluid is vaporized by the oven heat before it flows down the bore and escapes through the vents into the meat.

3 Robot to Probe for Oil. Lowered into an oil formation, an "automatic chemist" would analyze fluid seeping from rock at any level, thus revealing whether it was salt water, fresh water, oil or gas. Electrodes test the fluid's conductivity; pressure gauges, its rate of flow and, hence, viscosity. Electric dials at the surface tell the findings.

Please turn the page for more new ideas.

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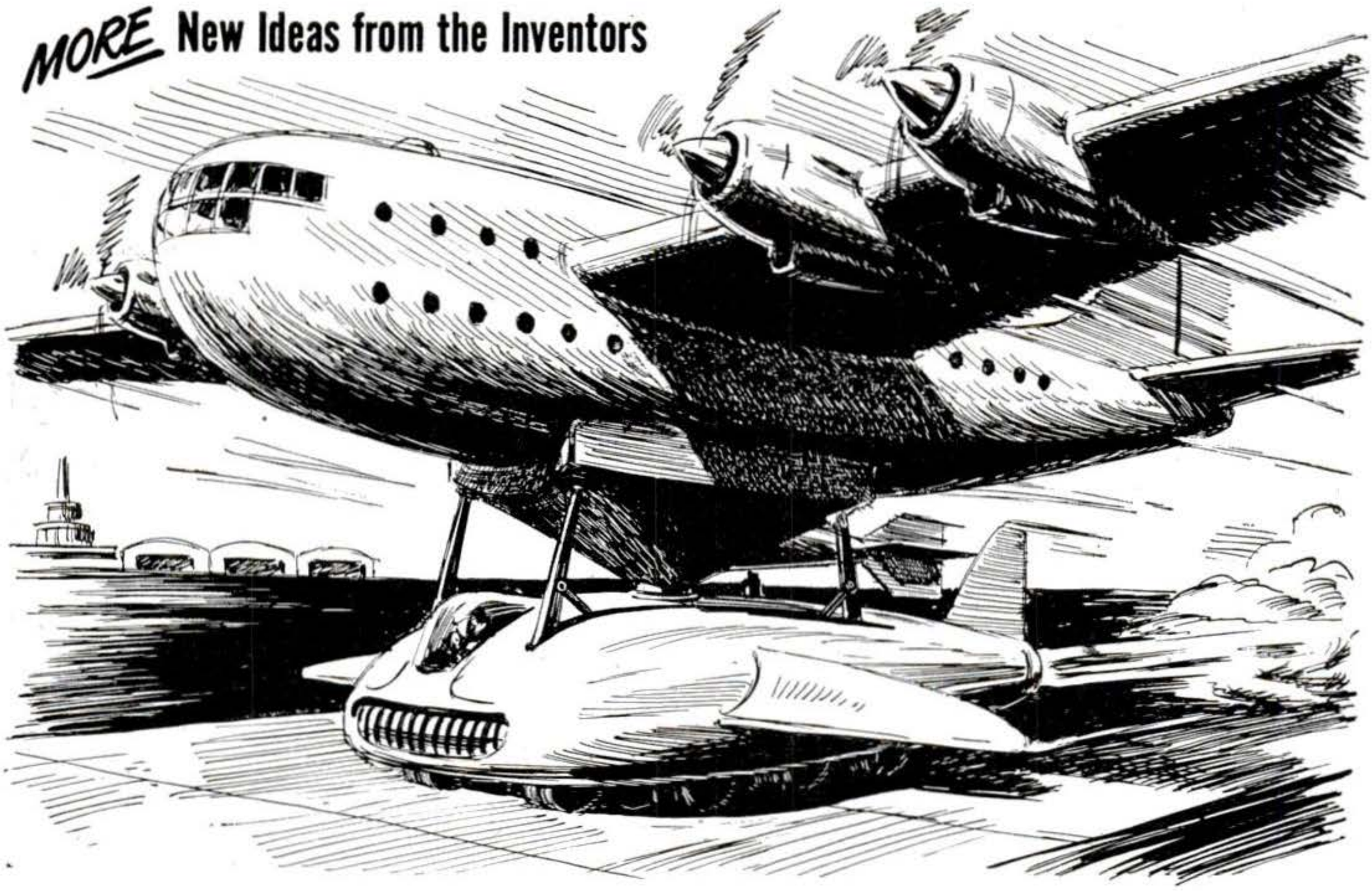
MORE New Ideas from the Inventors



4 Car to Launch Big Planes. Powered by jets or rockets, this streamline car, proposed by a French inventor, would boost heavy-laden airliners or bombers aloft. At flying speed, braces are retracted, plane and cradle swing into the wind, and the plane uncouples and soars away. Lest the car take off, too, it would have upside-down wings.

5 Net to Return Toys. Does Baby drop his toys over the edge of his play pen—and then howl because they're gone? Fitted to the outside of the pen, this slanting net would let harassed parents relax from fetching and carrying. Anything dropped into it comes right back to Baby.

6 Boat to Cruise on Land or Water. The outboard motor of this amphibious craft would turn a rear wheel equipped with a pneumatic tire for land traction and paddles for the water. Two front wheels would be lowered for road use, raised above the waterline when the craft is afloat.

U. S. patents on these inventions have been granted to: 1. Charles J. Pavlik, Denver; 2. Eugene T. Pedranti and Isabel M. Pedranti, Petaluma, Calif.; 3. Joseph H. Lane, Kansas City, Mo.; 4. Jacques Jean-Marie Jules Gerin, Boulogne sur Seine, France; 5. Norman C. Le Roy, Miami; 6. Osmario Rodrigues Branco, Santos, Brazil.

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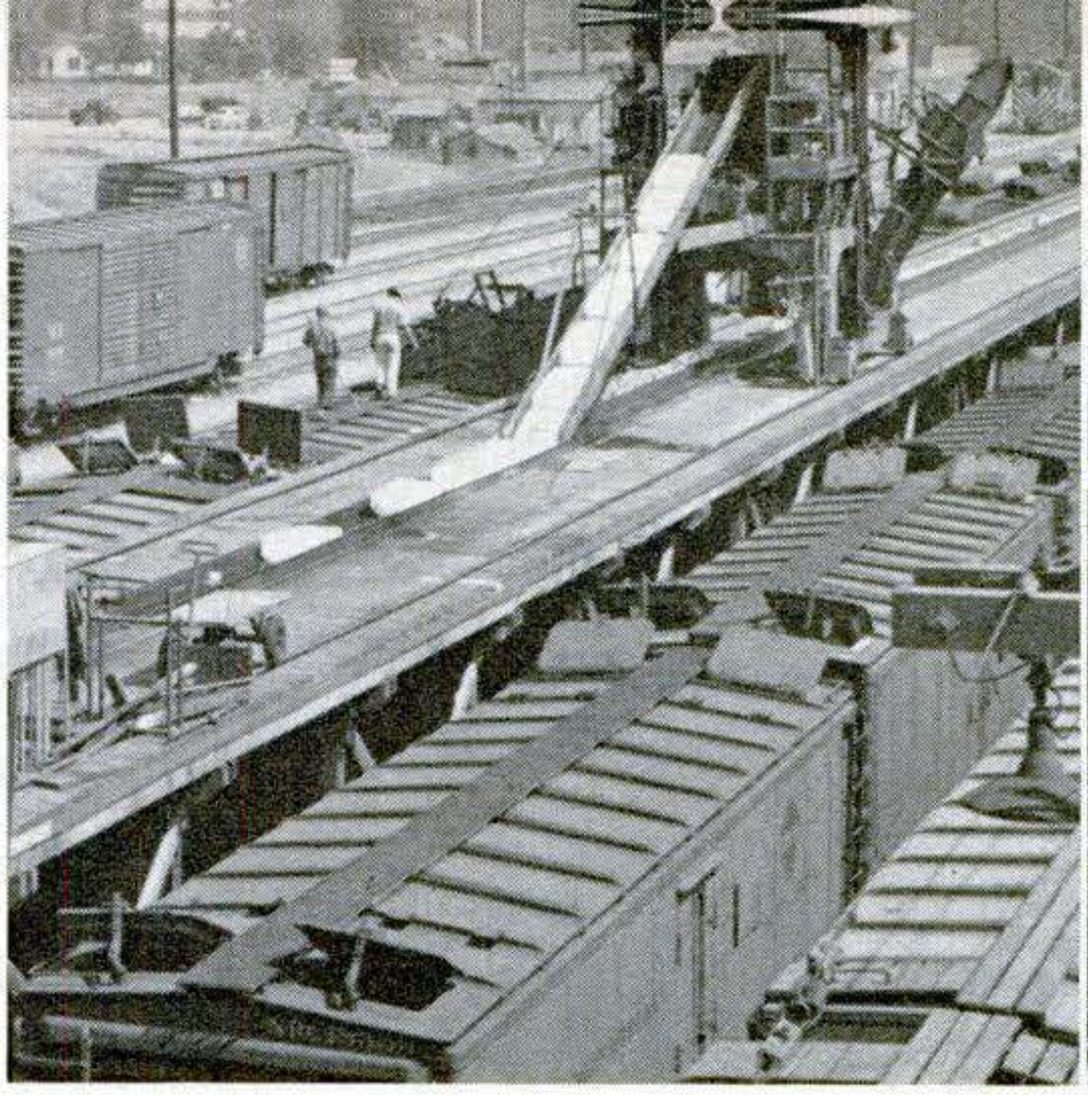
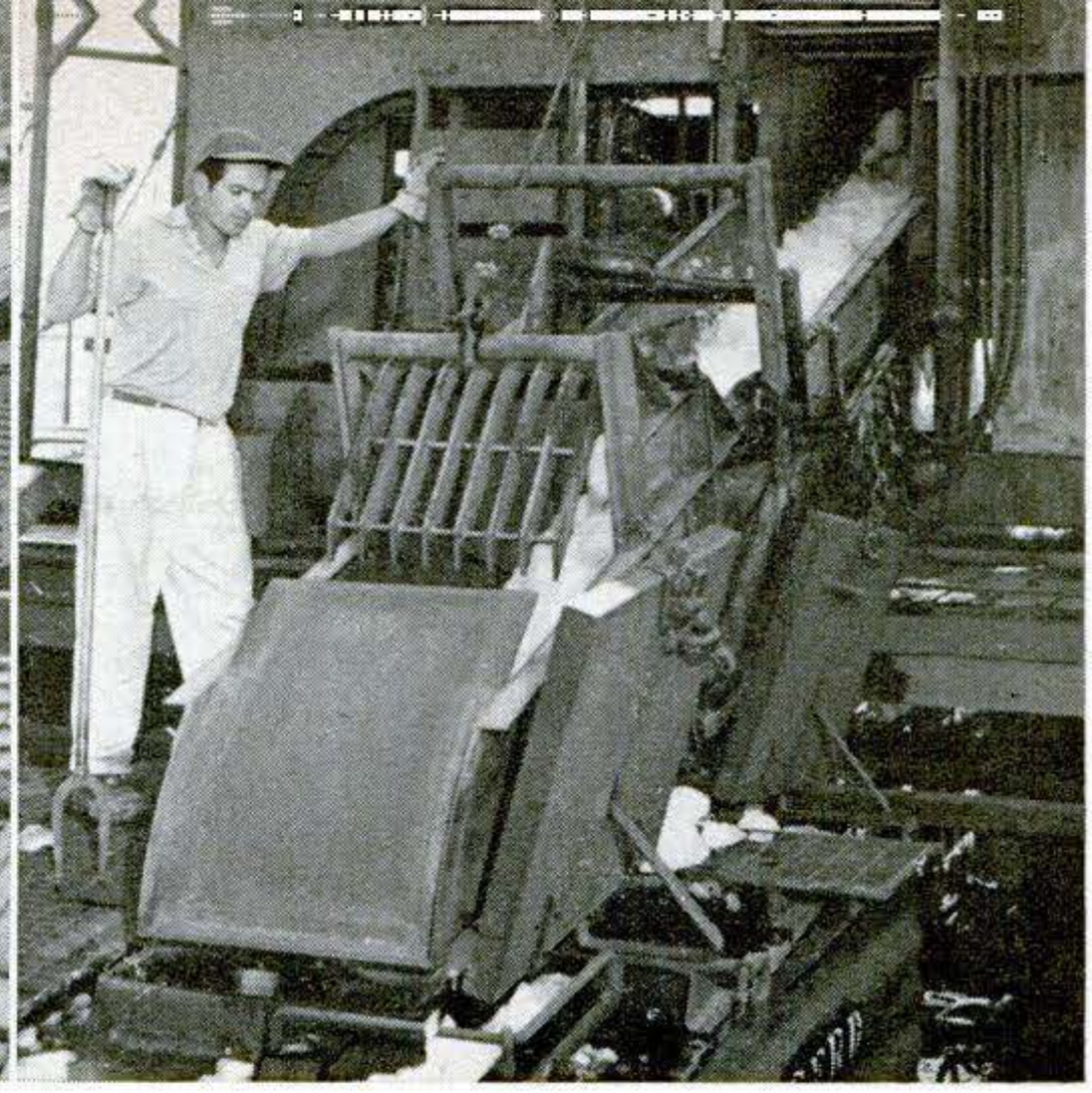
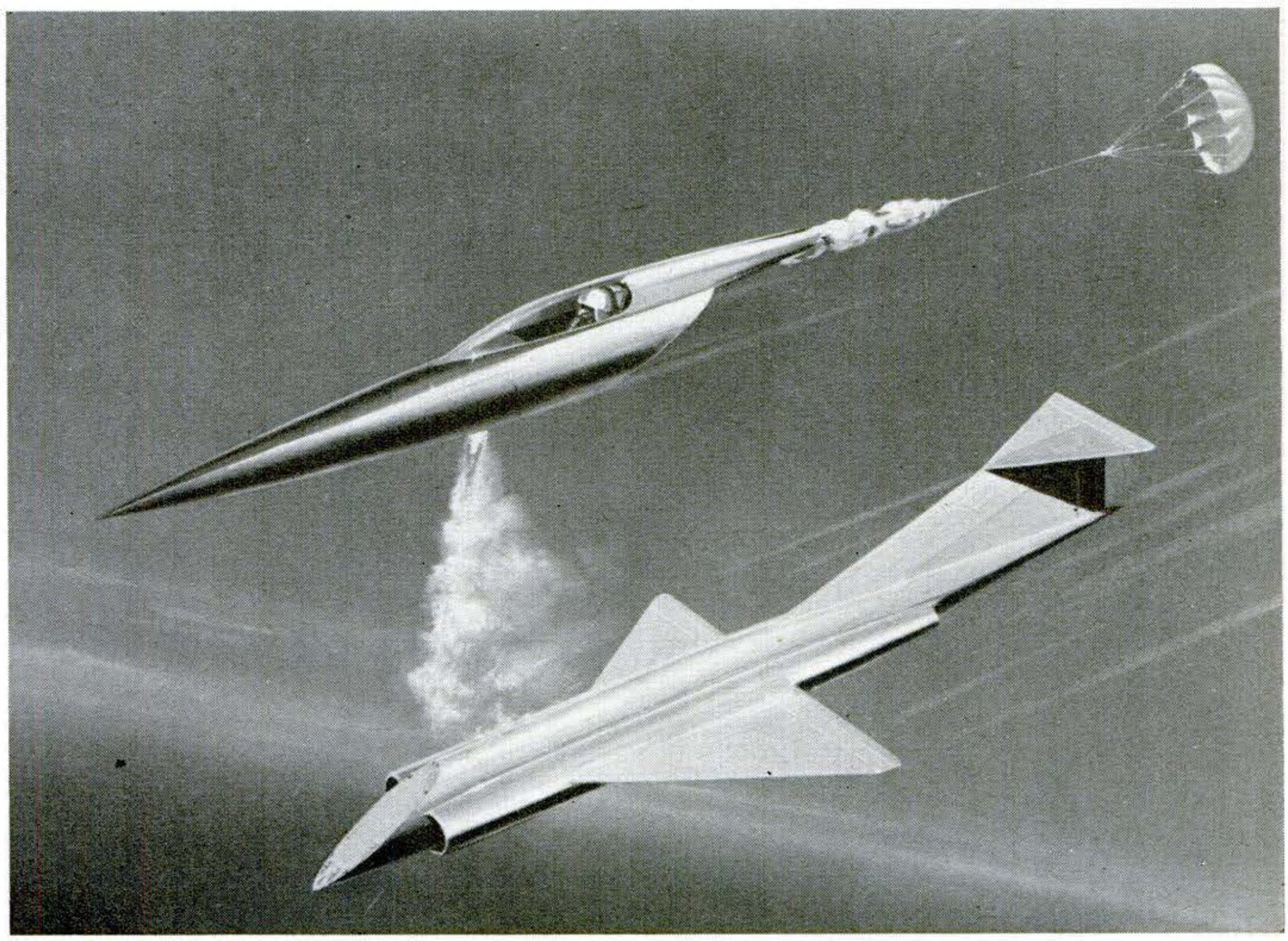




Mechanical Ice Man Handles Ton Every 10 Seconds

To KEEP perishable foods rolling, the Sante Fe Railway has installed a new kind of icing machine at its freight terminals. It travels on an elevated track (left above) and is electrically controlled by one man. Scooping up 300-pound cakes of ice from a conveyor, it chops them into chunks weighing 25 pounds or less (right above), then dumps the pieces into as many as 30 cars strung out at either side.



Emergency Exit: Plane to Split, Toss Pilot Out in Its Nose

EXPERTS are hinting that jet ships have nudged into the 3,000-mile-an-hour class. That's a lot of speed to get away from in a hurry when a pilot faces trouble. A. M. Mayo, Douglas engineer, proposes a craft that splits in half with the whole forward section carrying the pilot to safety. The pressurized cabin and nose of the plane would be shot away from the rest of the fuselage by rockets, then parachute down.

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Will Your Next House Have Central Cooling?

Complete air conditioning has come out of the dream-home class. This year it's standard in developments priced for ordinary folks.

By Robert Lasch

TOWARD the end of a blistering Midwest summer, a Kansas City builder last August put on display a small, air-conditioned house. A three-bedroom ranch, as the real-estate ads say, its doors were opened at nine a.m. on a Sunday. By 11 a.m. it was sold for $22,000.

Delighted promoters thought they saw a portent of things to come. Air conditioning might replace the super-duper kitchen as the lever for moving houses in the buyer's market that looms ahead.

If year-round air conditioning can be brought at moderate cost to homes costing less than $20,000, the consequences may be far-reaching. Home design will be sharply affected, the entire crop of un-air-conditioned homes will become obsolete more rapidly, and many towns will have to look for new and bigger sources of water supply.

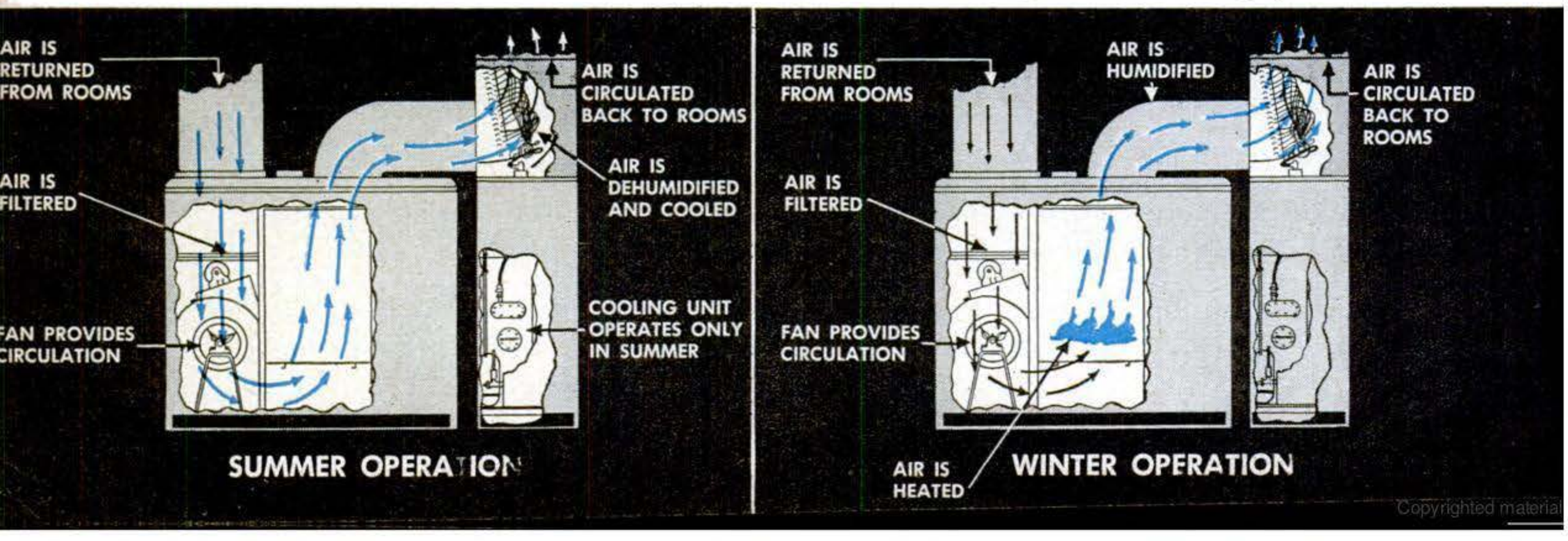
Air-Conditioned Houses from $8,000 Up

It may be too early to speak of a home air-conditioning boom—but Wadsworth Homes, Inc., a Kansas City firm that supplies sectionalized houses for local builders, plans to market 500 air-conditioned homes in seven midwestern states. In New Orleans, London Homes, Inc., last August built the first of 500 more. Others are in the works for St. Louis, Short Hills, N. J., and Greater New York. In Dallas builders have announced plans for 200 priced at only $12,500. In Miami there are reports of air-conditioned houses planned in the $8,000 class.

Behind this surge of interest are a

IN HOT WEATHER, a combination air-conditioning unit, such as the Chrysler Airtemp in the diagram below, circulates the air returned from the rooms over cold coils.

IN COLD WEATHER, the cooler is cut out of system; heating unit cut in. Airtemp heat unit can be either oil or gas type. Cooler can be used with existing hot-air heating system.



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Wadsworth house in Kansas City, Mo., includes complete air conditioning at no extra cost.

whole flock of new domestic air conditioners. Some are combined in a package with a furnace. Others can be attached to existing hot-air heating systems. All take whole-house, all-year air conditioning out of the custom-built, super-luxury class and bring it within reach of millions of homeowners with moderate incomes.

You have your choice of units in various sizes from ¾ ton to 3½ tons (ample for a seven-room house) and bearing the name-plates of famous manufacturers such as Carrier, Chrysler, Westinghouse, Servel, General Electric, York, American

AIR-CONDITIONING UNIT goes into basement the first day in some construction. Basement floor will be poured around and beneath the unit later, after the house is built above it.

IN NEW ORLEANS HOUSING PROJECT using slab construction, combined cooling-heating unit is set up on slab to determine just where it will go. Note slot in slab—air source for unit.

Radiator. A "ton" means here how much an air conditioner can cool.

Regardless of who makes them, all these packaged air conditioners except Servel work pretty much on the same principles. (Servel is different in using an "absorption" system in which the refrigerant is alternately heated and cooled instead of being compressed.) Most of them use the same duct system winter and summer. A thermostat switch operates the whole contraption. To heat, you flip a toggle, pick your temperature, and the big fan runs air over the heating grid. In summer an automatic damper bypasses the heater and routes the air across a coil of spiral-finned cooling tubes.

The cooling section works like an enlarged version of your refrigerator, except that it uses water instead of air to cool the refrigerant. Heat and humidity are taken out of the house air by the refrigerant, and the heat is taken out of the refrigerant by water. You get a complete change of air in five minutes.

More Than Comfort

People who visit the new air-conditioned display houses that are springing up quickly see that there's more than comfort to air conditioning. For one thing, it may mean significant changes in home design.

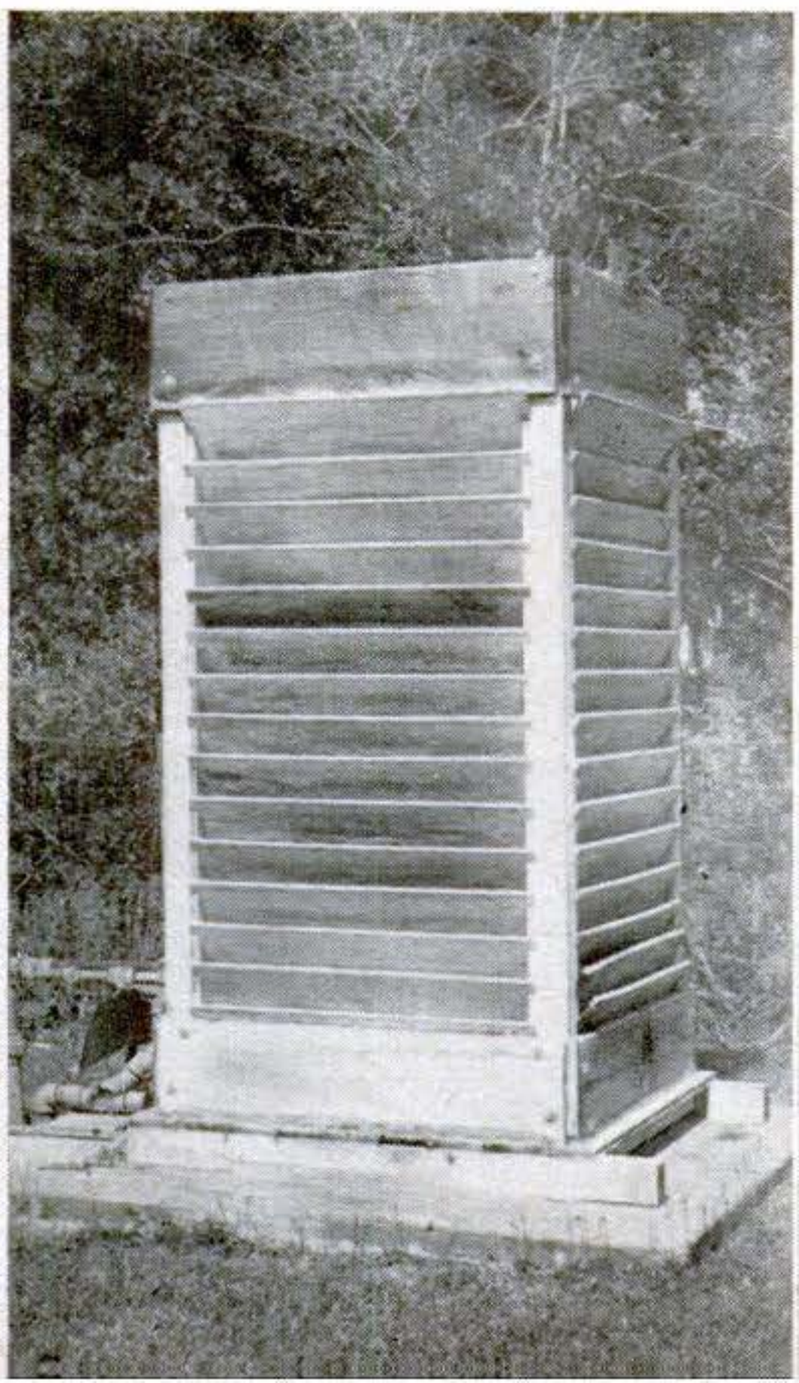
With cross ventilation unnecessary, the house plan becomes more flexible. The Wadsworth house has high windows in the two bedrooms facing the street, making for privacy and more mobile furniture arrangements. The living room has a large picture window facing the rear. All of its panes could be fixed, though some are movable because customers might not accept a fully sealed house. Along the kitchen and dining room a solid wall, providing space for kitchen equipment, storage wall and stair well, is feasible because there's no need for ventilation on that side.

It's Only the Beginning, Folks

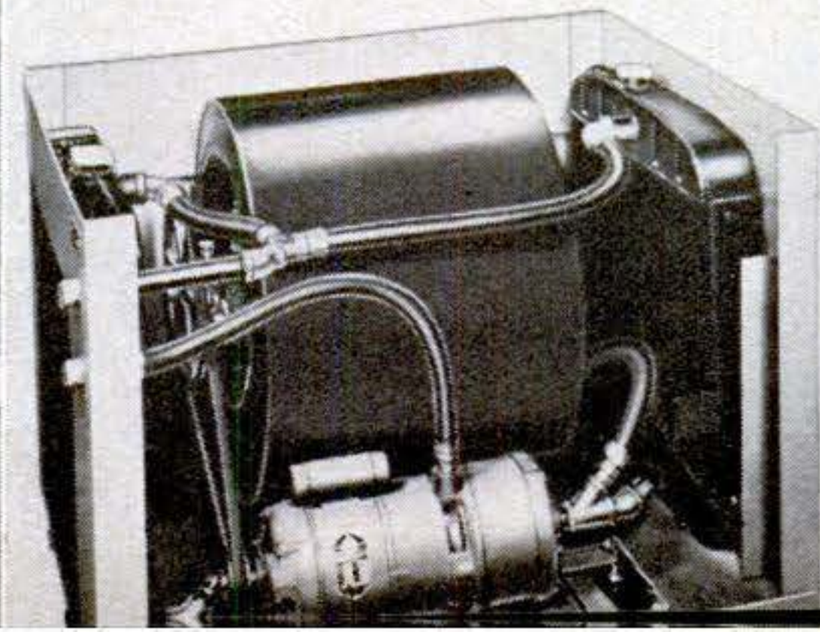
Such changes are only a token of those that could be made if an architect and his client let themselves go. With air conditioning the entire street wall can be solid and all windows located on one side for light and view. Bathrooms can be placed with maximum space economy on interior walls. All windows may be fixed, without movable sash or louvers.

Air conditioning, in short, may make the window something to see through but not to let air through. The price of this,

Where Water Is Scarce, Re-using It Cuts Cooling Costs



WATER COOLERS permit re-use of water after it has carried heat out of house. Marley natural draft tower (left) sprays water in air, cools it by evaporation. It must be exposed to wind. Aquatower (right), a mechanical-draft type, uses fan to blow air through water as it trickles down series of redwood slats. Unit can go inside house if it has access to outside air. Chrysler Water Saver (below) runs water through two auto-type radiators while blower draws air through them.



of course, is willingness by the householder to live sealed up in summer as he now does in winter—which means giving up the smell of fresh-cut grass and such summer sounds as birds twittering and the whirr of the neighbor's lawn mower.

How It Saves Money

Such radical alterations in design are in the future. But there are minor changes that can save money right now.

Carrier's 3½-ton unit costs the Wadsworth builder just under $1,800 installed. A hot-air heating system alone would cost about $700. The elimination of windows, the use of fixed sash and the omission of two extra corners that would have been needed for cross ventilation saved a total of $550. An attic fan would have come to $300. That still leaves $250 extra for air conditioning, but this builder figures his special building system more than makes up for it.

Cooling Is Expensive

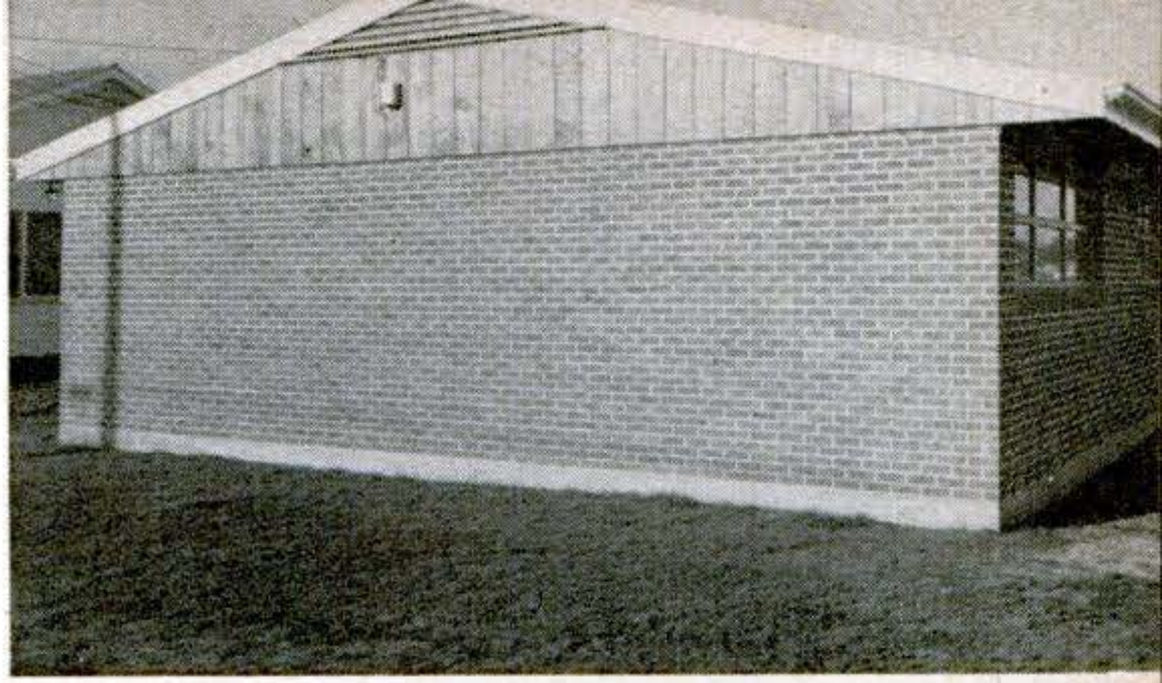
Cost of operation is something else. This varies, of course, according to climate, the design of the house and local rates for electricity and water. But a good guess is $1.25 a day up.

Generally, the air conditioner will cost more for cooling two months than for heating seven months, although some installations show about a 50-50 split for the two functions. One Carrier job in a 1,400-square-foot house at Lincoln, Neb., reported the following record for 52 days of cooling:

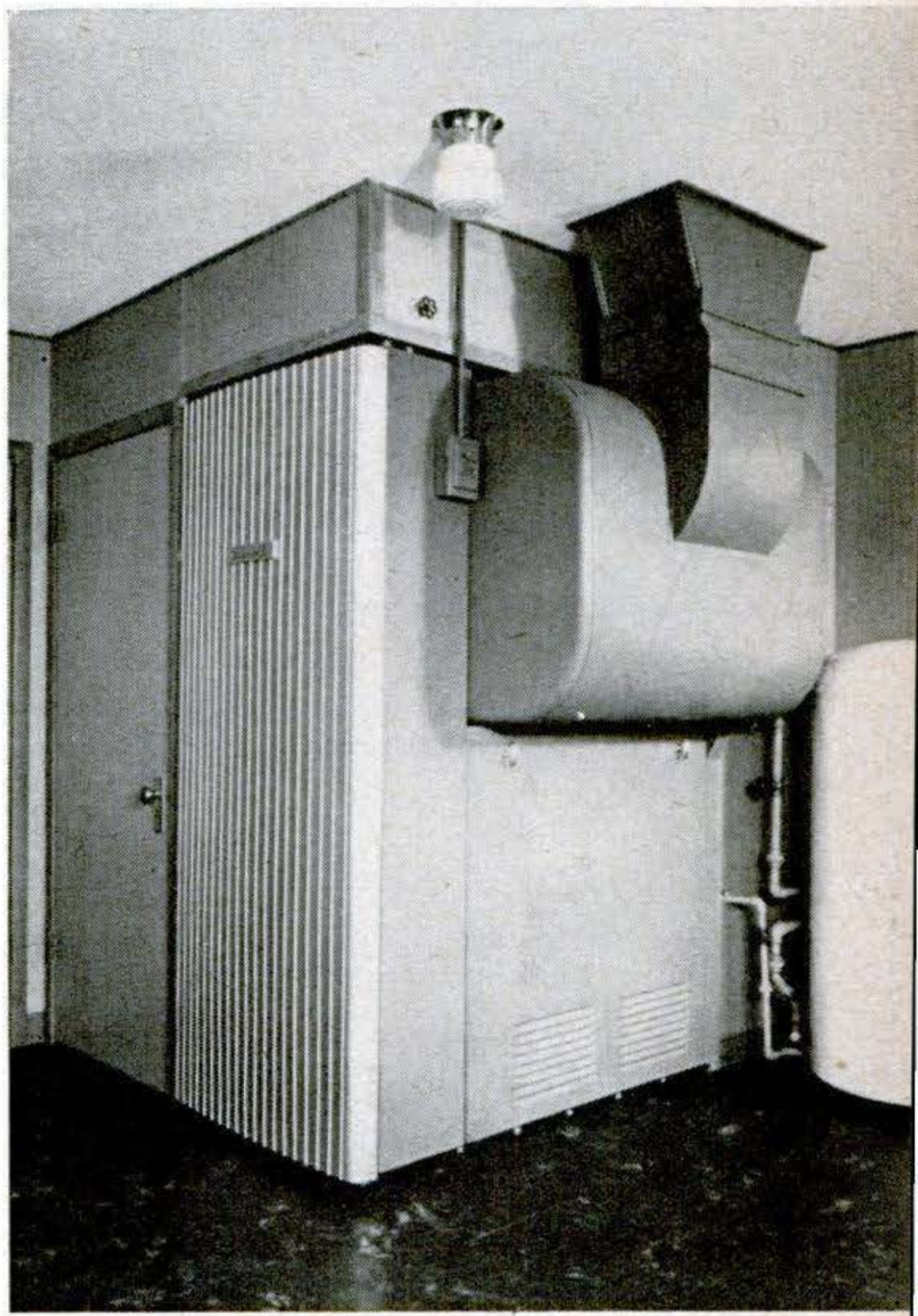
Heating cost (natural gas): $66.06.
Cooling cost: $74.10.
Electricity for cooling: 3,414 kwh.
Water for cooling: 198,000 gallons.

Ordinarily, the water, which is heated to 95° to 100°, goes down the drain, but where water is scarce or costly, it may be re-used by running it through a water tower in the yard, which adds up to $400 to the cost of installation. The tower is really a big shower stall, eight to 10 feet high. Warm water discharged from the cooling unit is pumped to the tower and sprayed into the air, where evaporation reduces its temperature and prepares it to go back and pick up more heat from the condenser. Since the water can be cooled by evaporating less than five percent of it, the tower makes it possible to re-use more than 95 percent of the water.

There must be at least a gentle breeze for the tower to work properly, so another type uses a fan to move the air past the water.



WINDOWLESS WEST WALL of this New Orleans house is possible because air conditioning makes cross ventilation unnecessary. Blind wall shuts out fierce afternoon sun.



SERVEL'S five-ton all-year-round air conditioning unit, above installed in cellar, works on different principle from others. It uses steam both to heat winter air and cool it in summer.

[Continued on page 260]

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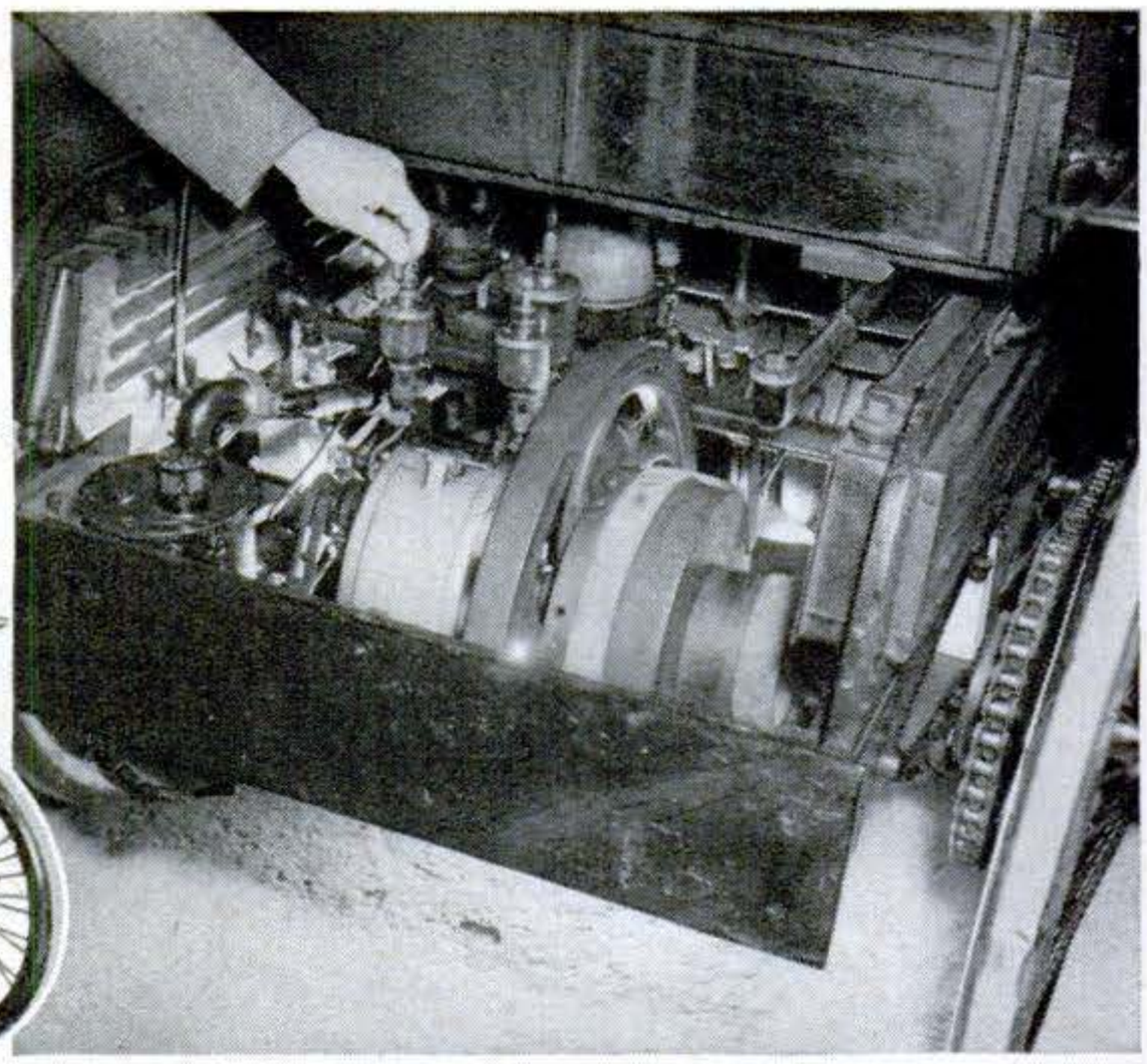


DRIVER CRANKS TO STEER (left), shifts with knee lever. Engine (above) has drip-feed oil cups to lubricate main bearings and cylinder.

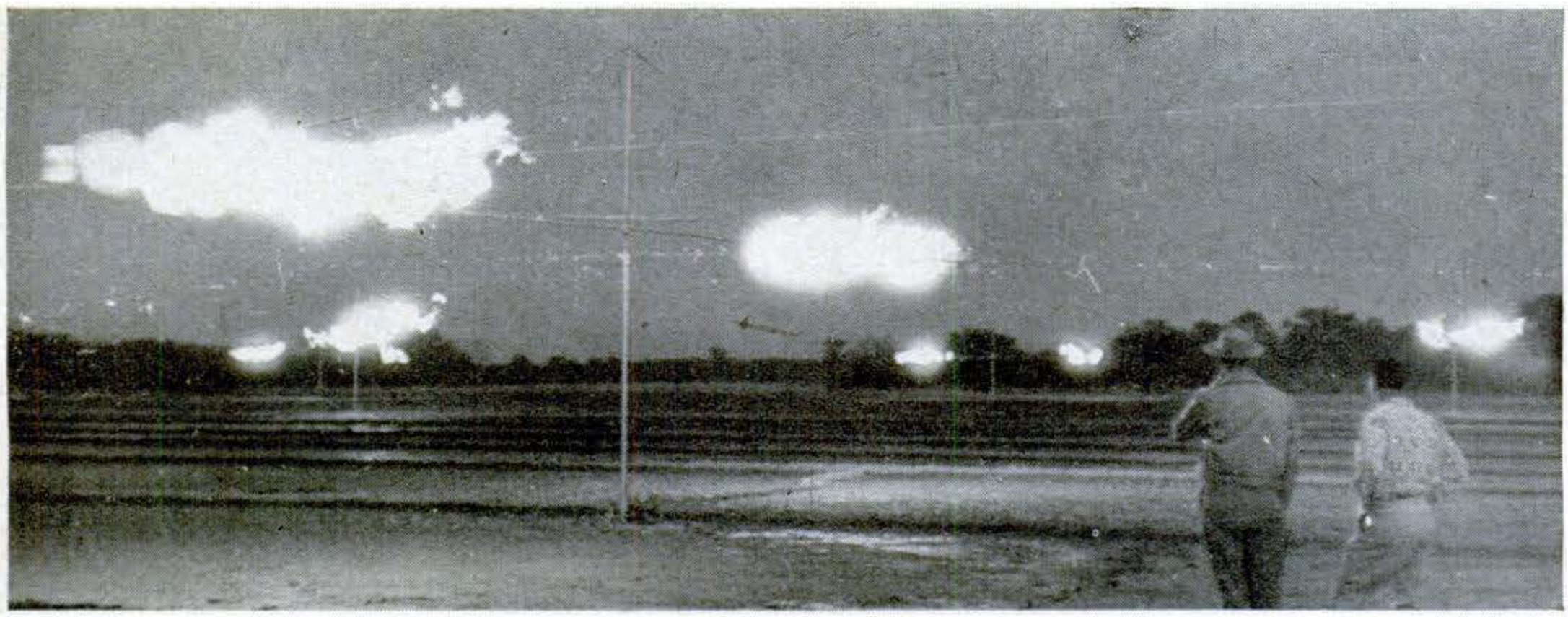
German Ancestor of the Model T Pays First Visit to U.S.

HERE's the world's first cheap car—the 1900 Benz "Comfortable"—a chain-driven German runabout that sold for $500 when most cars in existence cost far more. It will be displayed here to mark resumption of Mercedes sales in the U.S.

Only 1,000 of the cars were built between 1893, when it was designed, and 1900, when Benz stopped making it. Rolling on solid rubber tires, the Comfortable carried two passengers on a leather buggy seat that must have provided bleak comfort. For a little extra, its owner could have a rear-facing jump seat fitted to the dashboard.

The car weighed 726 pounds and could rip along at 19 miles an hour. A flat, one-cylinder gasoline engine at the rear developed three horsepower. A combination of belt-changing gears and a planetary gear gave three speeds forward but no reverse.

The runabout's battery-ignition system was one of the reasons it sold for less than other cars of the time. Most of them used costly magnetos.



Underground Gas Helps Farmers Fight Frost with Fire

WHAT looks like St. Elmo's fire in the night shot above is flaming natural gas protecting crops from frost in Texas. Piped from underground, the gas is fed to heaters that are shaped like crosses and rise 10 feet in the air. Each cross has jet-tipped arms 46 feet long that rotate like lawn sprayers. One heater takes care of 1½ acres. Leonard A. Salmon of Hidalgo County devised the heaters.

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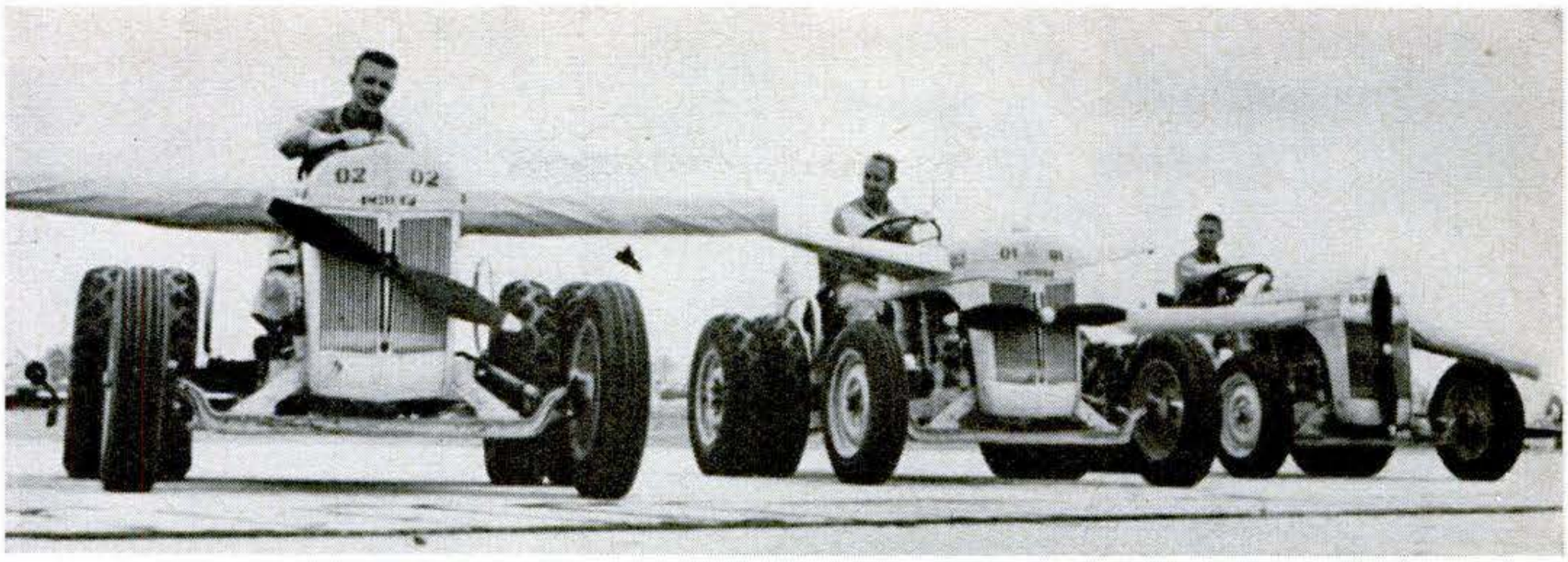
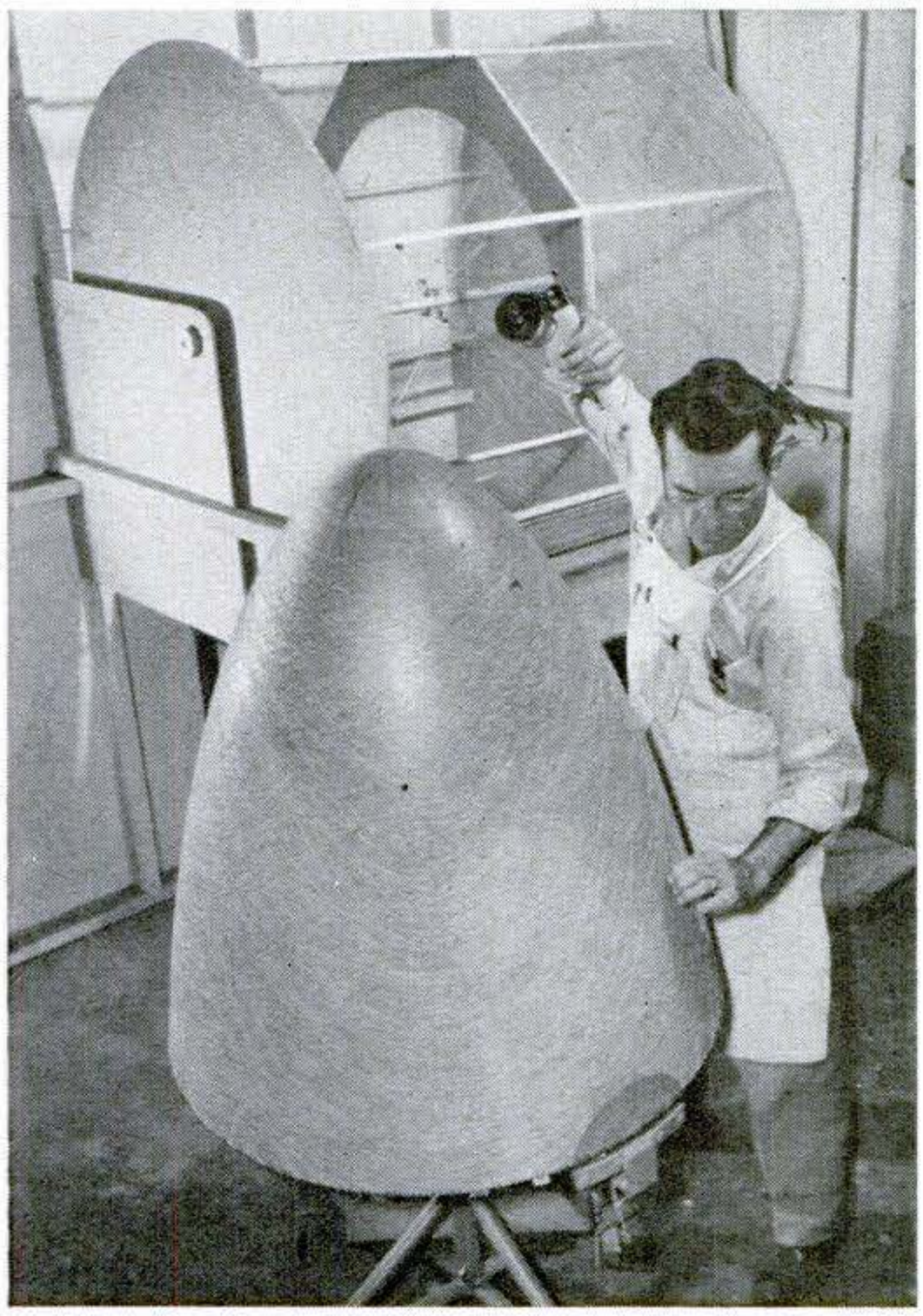


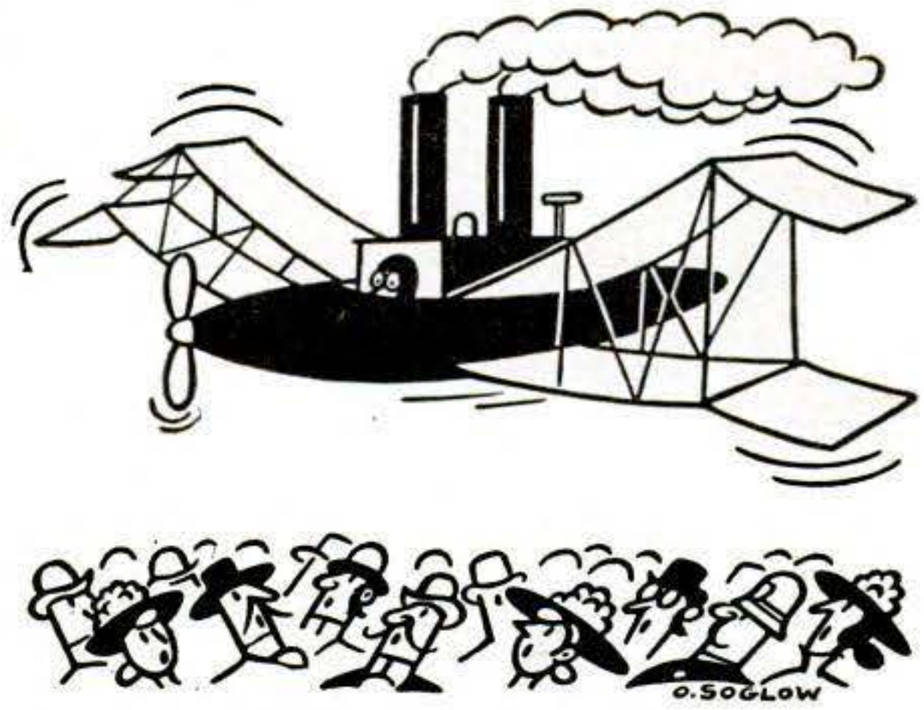
Winged Tractors Give Pilots a Workout on Foggy Days

WHEN the ceiling is zero, these Naval Aviation cadets still practice formation flying. They tootle around Saufley Field, Fla., on tractors with false wings, tail assemblies and props. In groups of three, they wheel and turn in the fog, forming aerial patterns on the ground. In fair weather, the boys fly SNJ trainers.



Thread Toughens Plane Nose

THIS workman is wrapping a plastic radome with a glass-fiber thread 24 miles long. Molded in place under heat and pressure, the thin filament—only six thousandths of an inch in diameter—will make the plastic nose more rugged when it bucks heavy air pressures and takes the battering of hail. North American Aviation plans to wind the radomes by machine for F-86 Sabres after experimental tests have been run.



75 years ago this month

Popular Science Monthly reported:

"WE ARE evidently fulfilling at least a part of that well-known poetical prophecy which Darwin wrote in the early days of the steam engine, and possibly before Watt had told him of the great advance which had been produced by his inventive genius:

"'Soon shall thy arm, unconquered steam, afar
Drag the slow barge, or drive the rapid car;
Or, on wide-waving wings expanded, bear
The flying chariot through the fields of air.'"

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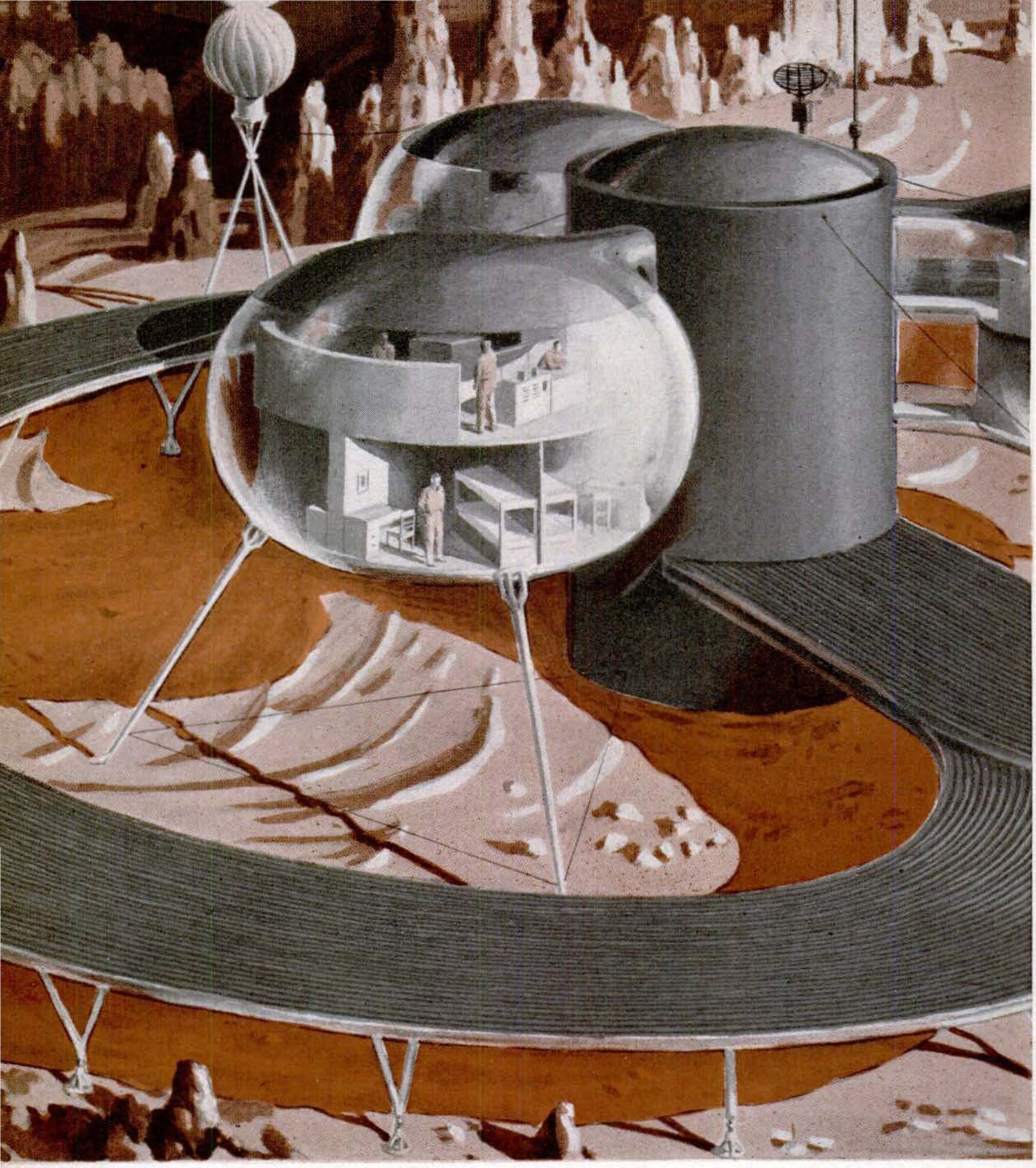

Proposed Mars base looks like this. The heart-shaped ring captures solar heat to warm living

How We'll Live on Mars

A bold scientific report describes an amazing scheme that would let a party of 33 set up housekeeping on our neighbor planet.

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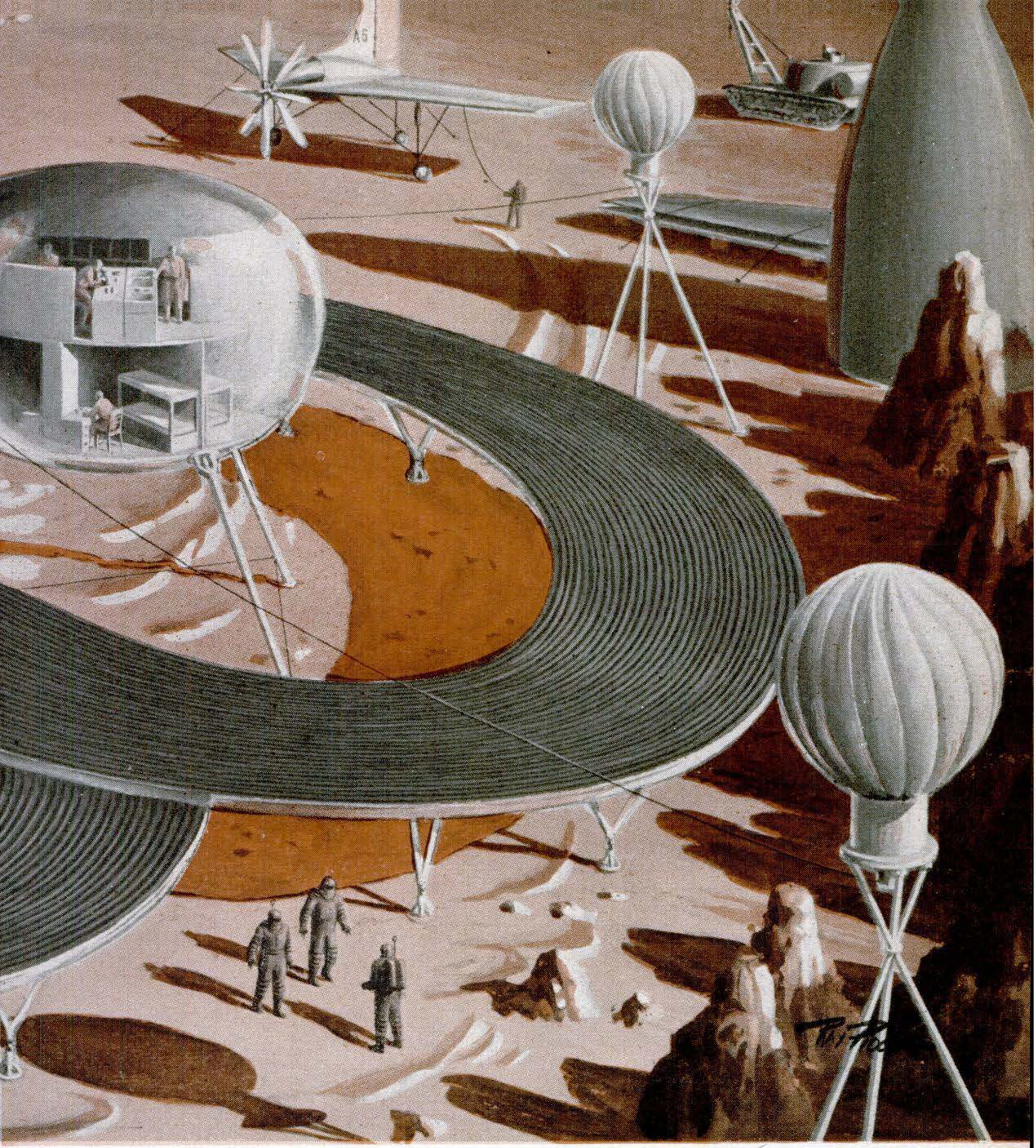

quarters for 33 men in spheres and cylinder. Plane and tractor will run in oxygenless air.

By Alden P. Armagnac

WHEN the first expedition from Earth sets foot upon the planet Mars, 33 courageous men will make up the landing party.

From a winged rocket ship that has swooped to a horizontal landing on wheeled gear, they will emerge wearing pressurized suits and oxygen helmets.

As they step to the dusty red ground, one of their number beyond doubt will plant a flag to mark the history-making achievement. But there will be scant time for ceremony.

For the landing party's first and press-

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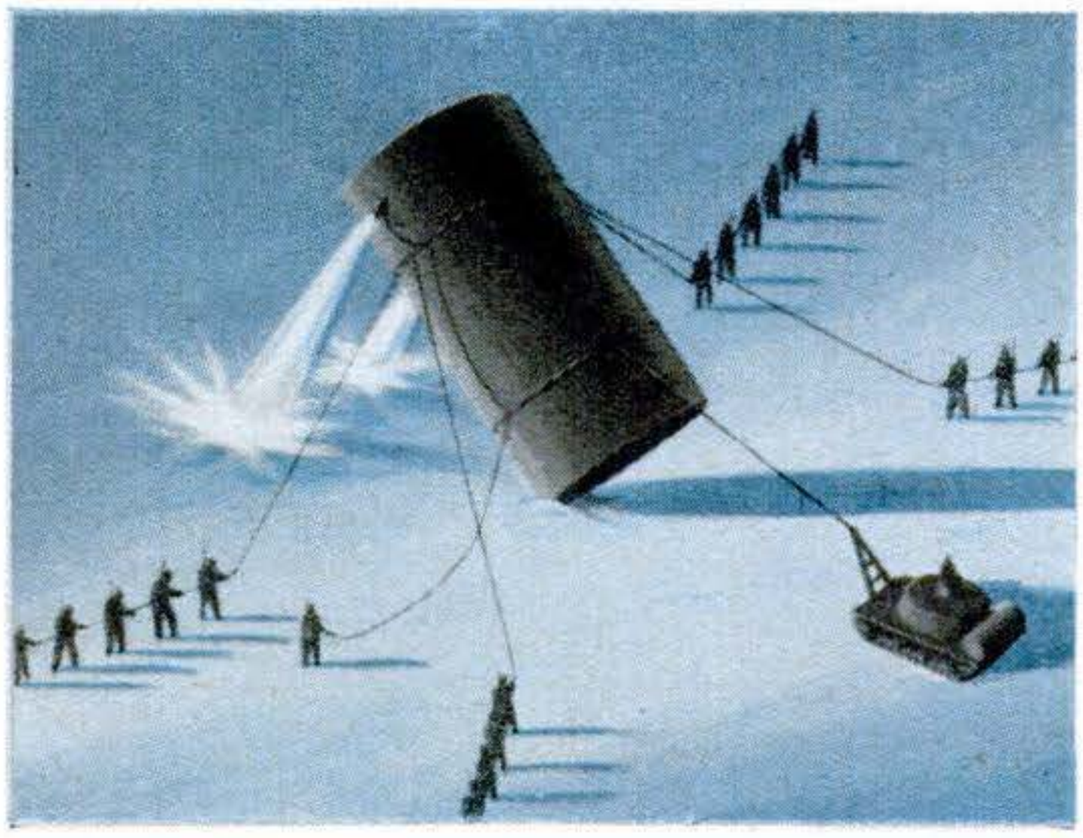

AS FIRST STEP IN SETTING UP BASE, landing party's rocket ship is stripped of nose and wings, and jato units are attached at end of remaining aluminum-clad cylinder. Steadied by lines, it is up-ended to form hub of base.

SOLAR HEATER, plastic envelope containing six-inch air ducts, is first of extensions to emerge from hub. As compressed air inflates loose folds, it forms a ring 16 feet wide and nearly 150 feet in over-all diameter.

PLASTIC SHELLS forming living and working spaces now emerge from other ports of cylinder. Expanded, they form three flattened spheres, each about 32 feet wide and 20 feet high, containing an artificial atmosphere.

ing task will be to erect living quarters that will house the 33 and enable them to survive a 430-day stay in Mars' rarefied and oxygenless atmosphere before returning to Earth.

Seen from a distance, the weird structure forming their completed base will look like a number of eggs propped up and balanced on toothpicks. Because it must be engineered especially to suit the novel conditions on Mars, and to be transported there in a rocket ship, it will resemble nothing ever seen here on Earth.

Master's Thesis Studies Problem

So unusual and challenging are the problems of designing a Martian base that a special study of them has just been made. The result, a 79-page thesis entitled "A Prototype Technical Research Center for Extraterrestrial Exploration," has been submitted by Alfred William Moffett in partial fulfillment of the requirements for the degree of master of architecture at Massachusetts Institute of Technology.

In preparing it he has had the interested assistance of a panel of experts including leading MIT and government scientists. For authentic information on even the most minor points, he has pored through scores of technical treatises and scientific reports. Thus he arrives at the documented and authoritative conception summarized on these pages. Architectural sketches and diagrams illustrating his thesis have served as the basis for the artist's drawings reproduced here.

Expedition Planned, Too

In order to visualize a Martian base, Moffett realized at the outset, he would have to know how many men would make up a landing party on the planet, how long they would stay there, and exactly what they would want to do during their stay. So he and his scientific advisers found themselves the planners, not only of the base—but also of the expedition itself.

Scientific discoveries will be the ob-

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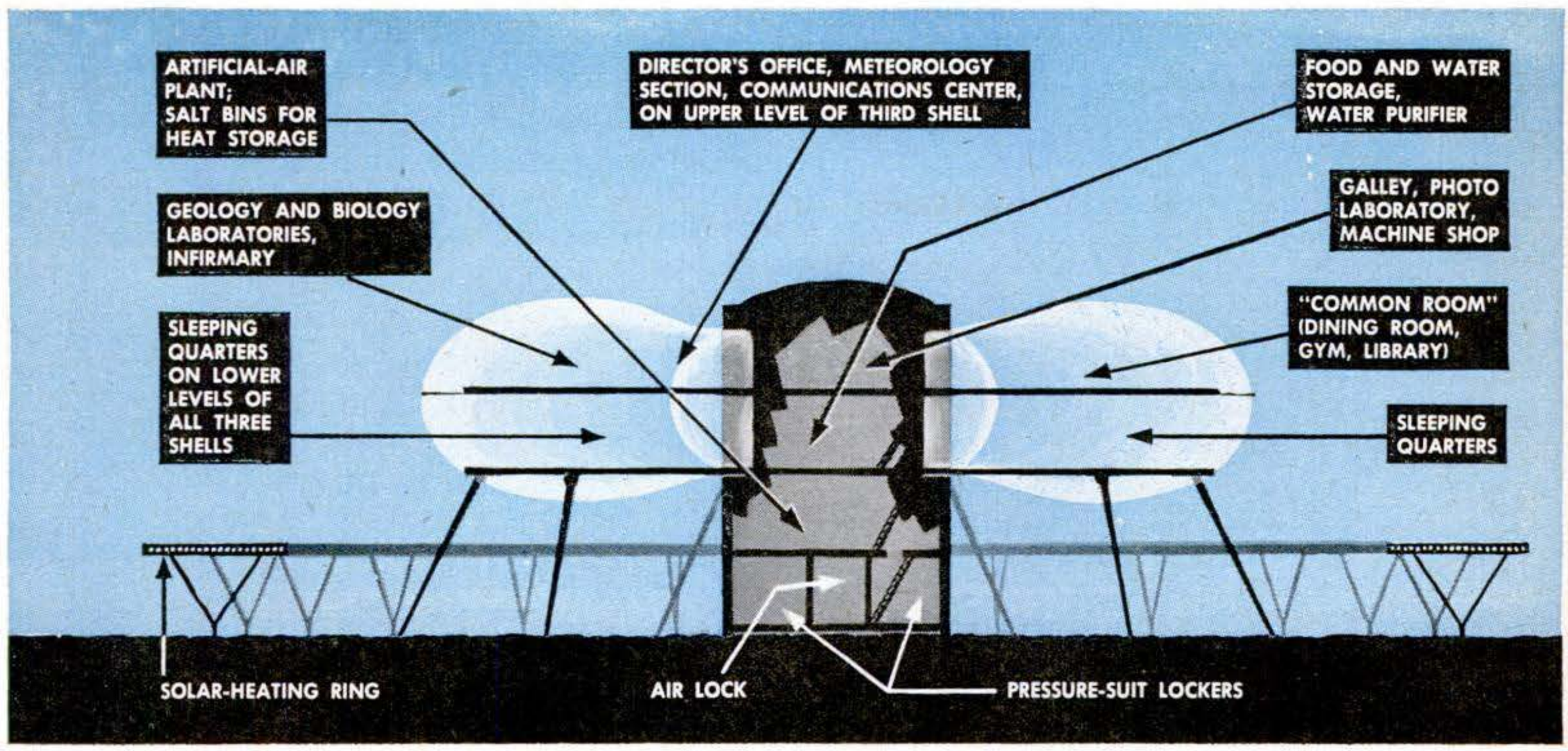

CUTAWAY VIEW OF ERECTED BASE shows interior arrangement of central cylinder and spheres. Laboratories, galley and combination dining and recreation room occupy top level; sleeping quarters, next level below. Air lock at ground level is the base's entrance and exit.

ject of this voyage to a new world. Once and for all, it will settle the moot question of whether life exists on Mars—and, if so, what kinds. It will solve the riddle of the planet's "canals," believed by some to be engineering works of intelligent beings, and by others to be natural markings. First-hand studies will be made of Mars' wind, weather and climate. Minerals will be collected that may be new to science, or rich in elements rare and coveted on Earth. Strange and beautiful gems, born perhaps of volcanic conditions unlike those on our own planet, may sparkle from Martian rocks.

Roster Already Selected

And so the landing party's personnel will consist largely of experts in these fields of science. Here is its proposed roster:

Administration: A director, two clerks and a supply officer.

Scientific Operations: Three meteorologists, three biologists, a doctor, four geologists, and 13 technicians to assist these scientists.

Technical Services: Two radiomen, two pilot-mechanics, a machinist and a cook.

The director will choose a second-in-command from among the others of the party. The supply officer will also be chosen from among the personnel, and assigned that duty in addition to his others; hence the estimated total of 33 men for the landing party.

It will contemplate no such fantastic scheme as attempting a nonstop flight from Earth to Mars—for that would call for a spaceship of size, power and fuel capacity too remote from practicability to be considered at the present stage of rocket technology.

So it is presupposed that, before the Mars venture, a satellite station has been set up in space about 1,075 miles above Earth as a terminal and fueling stop for interplanetary spaceships.

Mars Satellite the Jumping-Off Place

And space-construction gangs of Earthmen carried onward by these ships, it is further assumed, will have succeeded in establishing a similar space station as a satellite of Mars and only 600 miles away from it. To an observer at this farthest outpost, the planet looms up so close and large that it presents a truly magnificent spectacle. More than halfway across the star-flecked sky extends its enormous disk of orange and blue-green, seemingly

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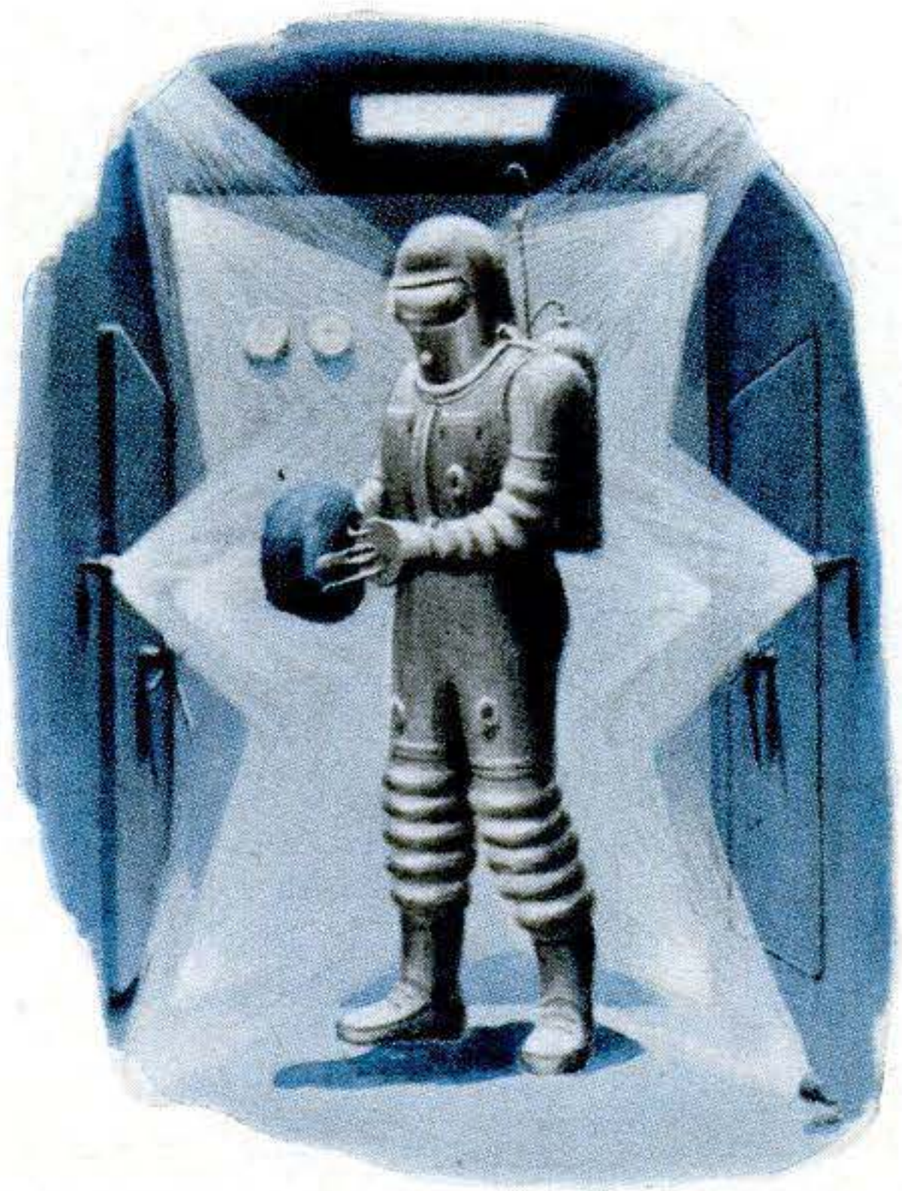
only just beyond reach—tantalizing, mysterious, perilous.

It is from this jumping-off place, then, that the landing party boards a delta-wing rocket ship for the culminating adventure—the first voyage to the surface of Mars.

So that Mars' gravity can take effect upon the ship, rocket jets brake its orbital speed, and the rocket motor then is jettisoned. As an airplane, the craft spirals down through Mars' thin atmosphere to the planet's surface.

The landing confronts the explorers at once with one of the most formidable of the facts of life on Mars. Its air contains little or no oxygen, certainly not enough to keep an Earthman alive. And so low is the atmospheric pressure at Mars' surface—equivalent to that at 10-mile altitude above Earth, or twice the height of Mt. Everest—that exposure to it would risk a fatal attack of "bends." Explorers must use artificial oxygen and pressure.



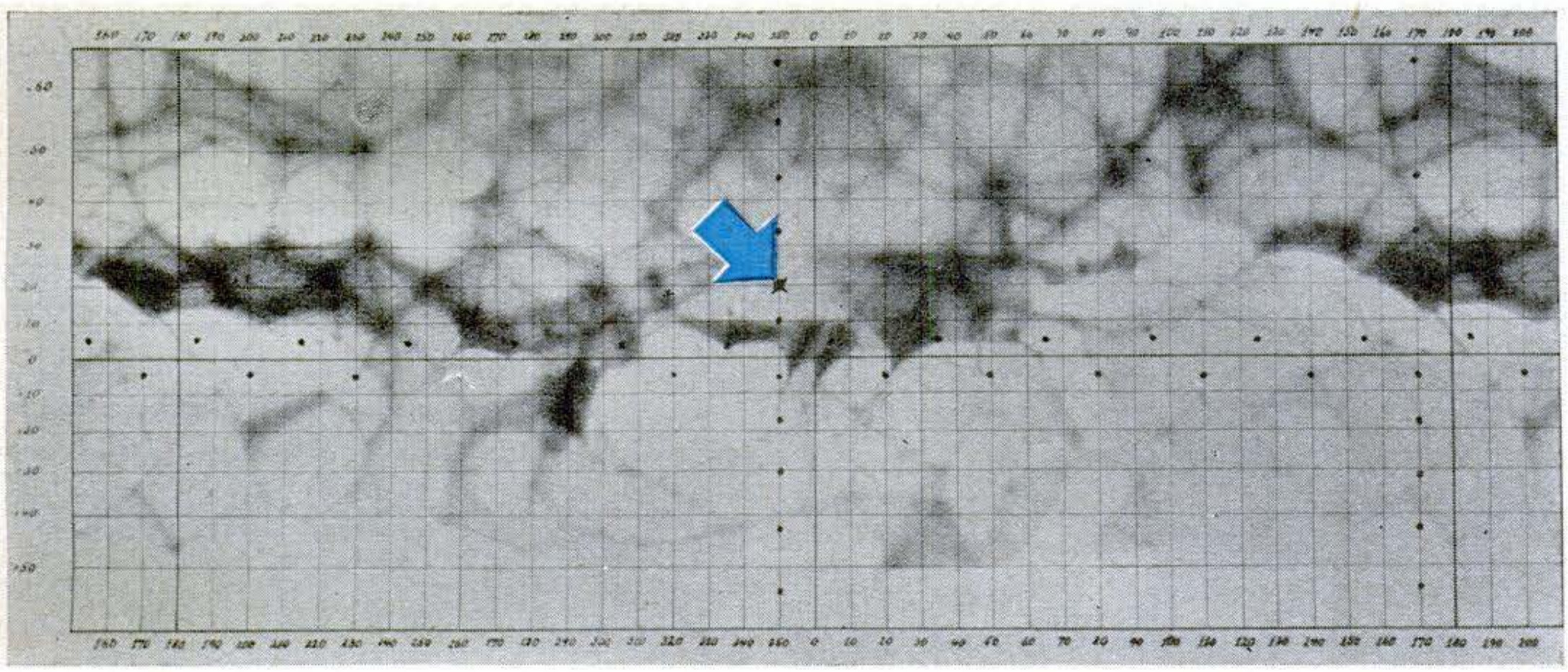
DECONTAMINATING MIST sprays explorer in air lock as he returns to base, lest he bring in Martian germs that might cause diseases hitherto unknown.

Clad in protective, inflated pressure suits with oxygen gear, they put into action a well rehearsed plan to set up a base affording livable surroundings. Its cylindrical hub, the stripped fuselage of their spaceship, sprouts extensions of Fiberglas-reinforced plastic, which are inflated with compressed air. They form a solar-heating ring, in which air is warmed by the sun's rays; and three nearly spherical shells serving as two-story living and working quarters, with floors suspended on cables. Light struts supporting these appendages are anchored to the ground with pins shot from cartridge guns.

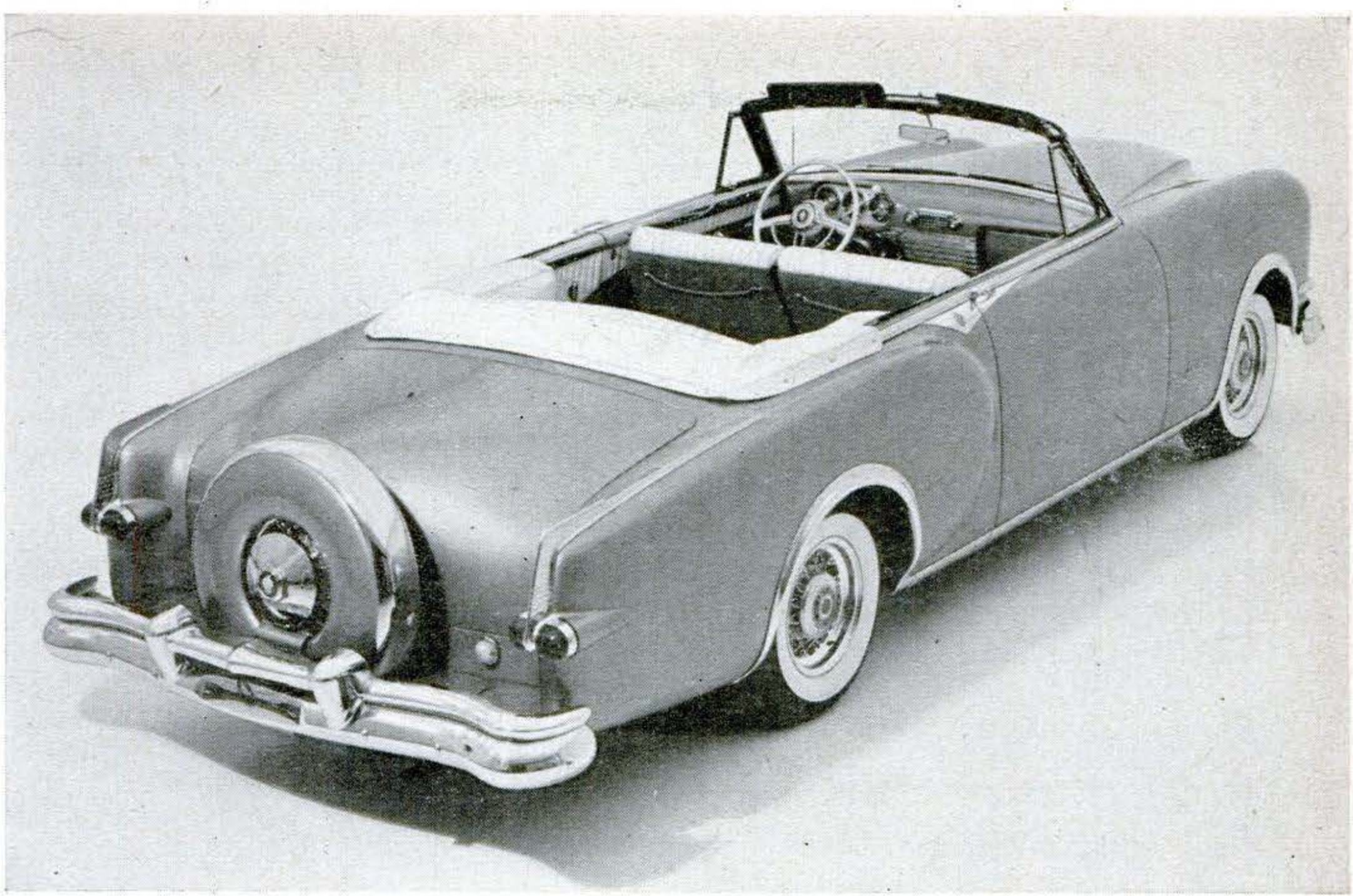
Erecting wind generators for power, and leading electric cables from them to the base, complete the exterior preparations.

Now the explorers can breathe more freely—figuratively and literally. Entering their new base through an air lock in the central cylinder, they can doff their pres-

[Continued on page 262]

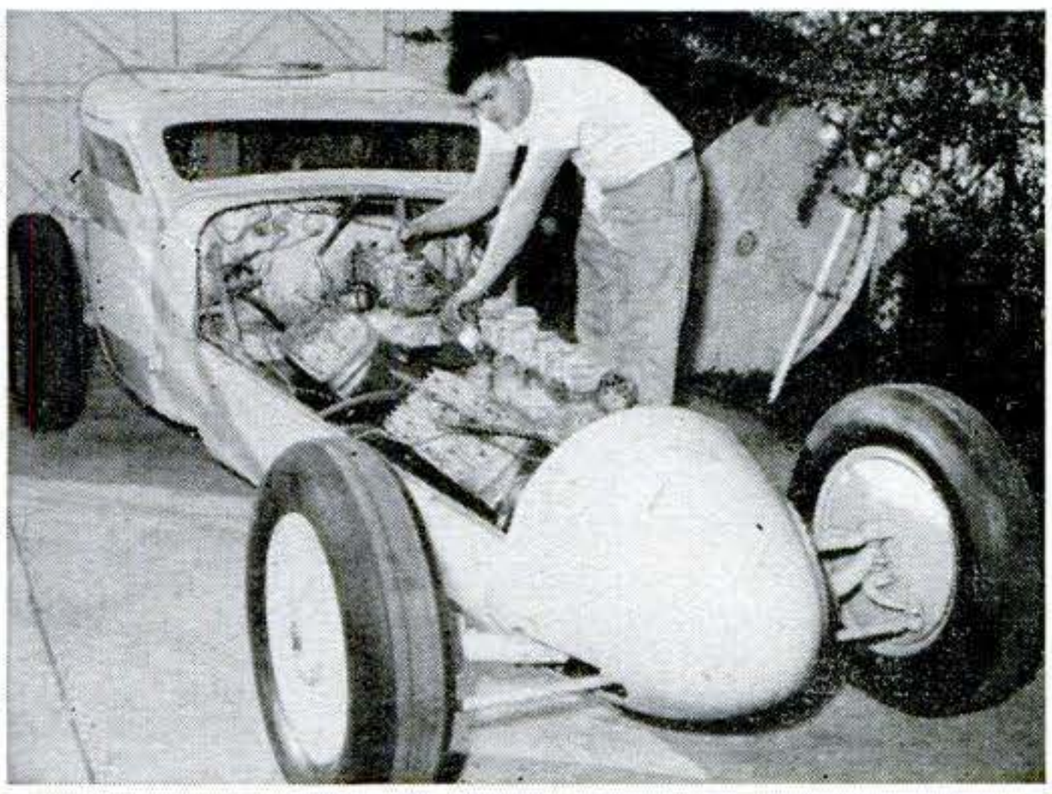


MERCATOR-STYLE MAP OF MARS shows proposed site of base (arrow) and of automatic weather stations (small dots). Sub-base sites would be chosen after landing party arrives.



Packard Offers New Sportster with Italian Look, 180 Horsepower

PACKARD'S bid for the super-duper sportster trade is the custom-built Caribbean above. It costs $5,200 and was developed from the hand-built Pan American which won styling and engineering awards at two motor shows. The car has a 180-horsepower engine and a 122-inch wheelbase. The Italian school of design is reflected in the wire-spoke wheels and cut-out rear fender. There is a real air scoop on the bonnet.



Twin Mercs Make 198 M.P.H.

THIS twin-engine job hit 198 miles an hour—a world's record for its class. Mickey Thompson of Alhambra, Cal., built the car around a Ford chassis. Two Mercury engines with chain-link connection are mounted tandem. Most of the body of the 1,832-pound car is glass-fiber-reinforced plastic.

Thompson also races the same car in other classes by replacing the 275-horsepower twin Merc with a Chrysler or Ford.

Station Wagon Sleeps Two

A VERSATILE British car goes the American station wagon one better. It will carry seven passengers or, with seats removed, handle the usual light trucking. Then, come nightfall, it provides beds for two.

Turning the seats upside down forms overnight sleeping accommodations or allows use of the car as an emergency ambulance. The Utilecon was displayed at a commercial-vehicle show in London.

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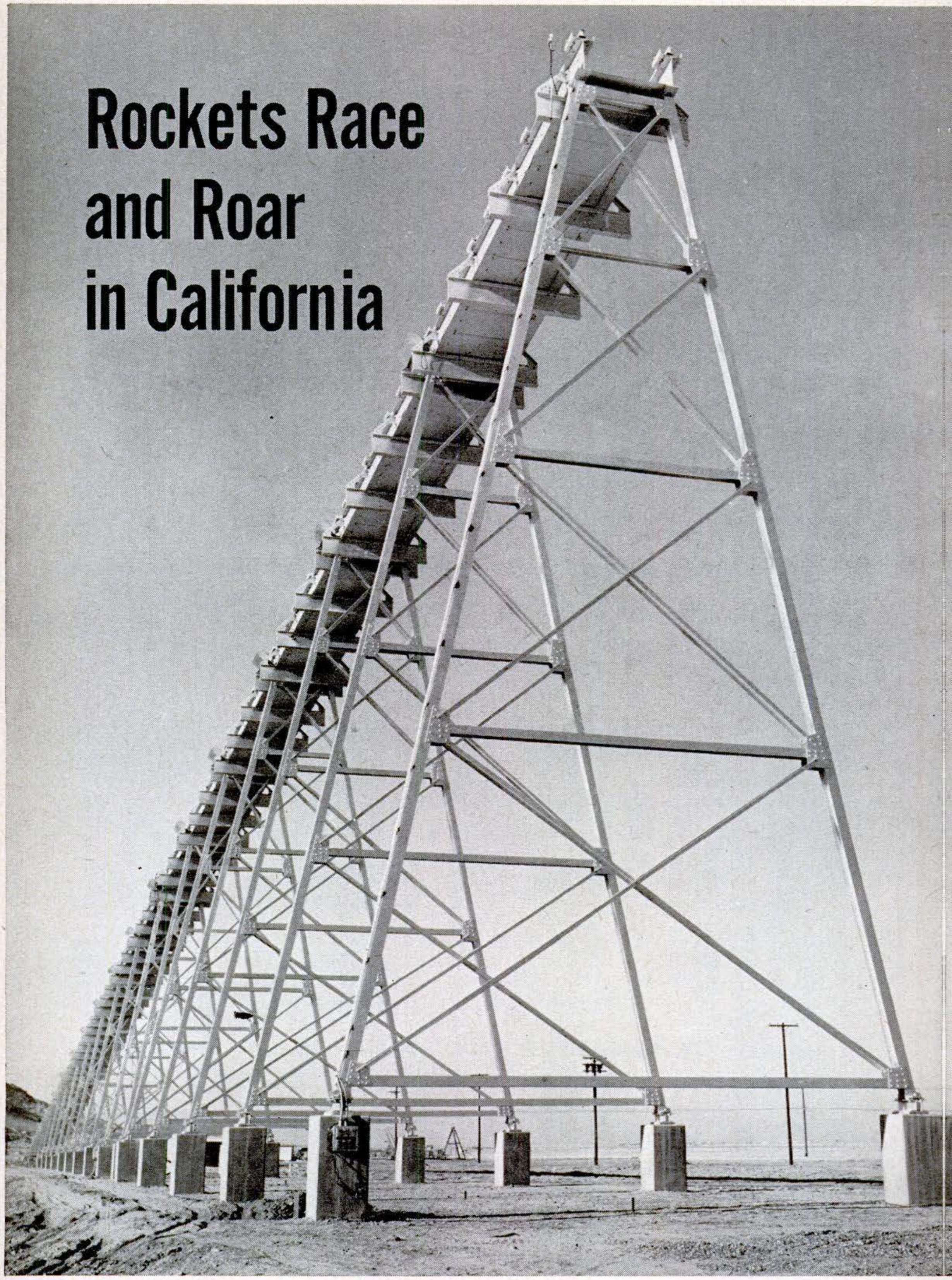
Rockets Race and Roar in California



Launching end of Navy's 544-foot inclined rocket ramp at Inyokern stands 60 feet high.

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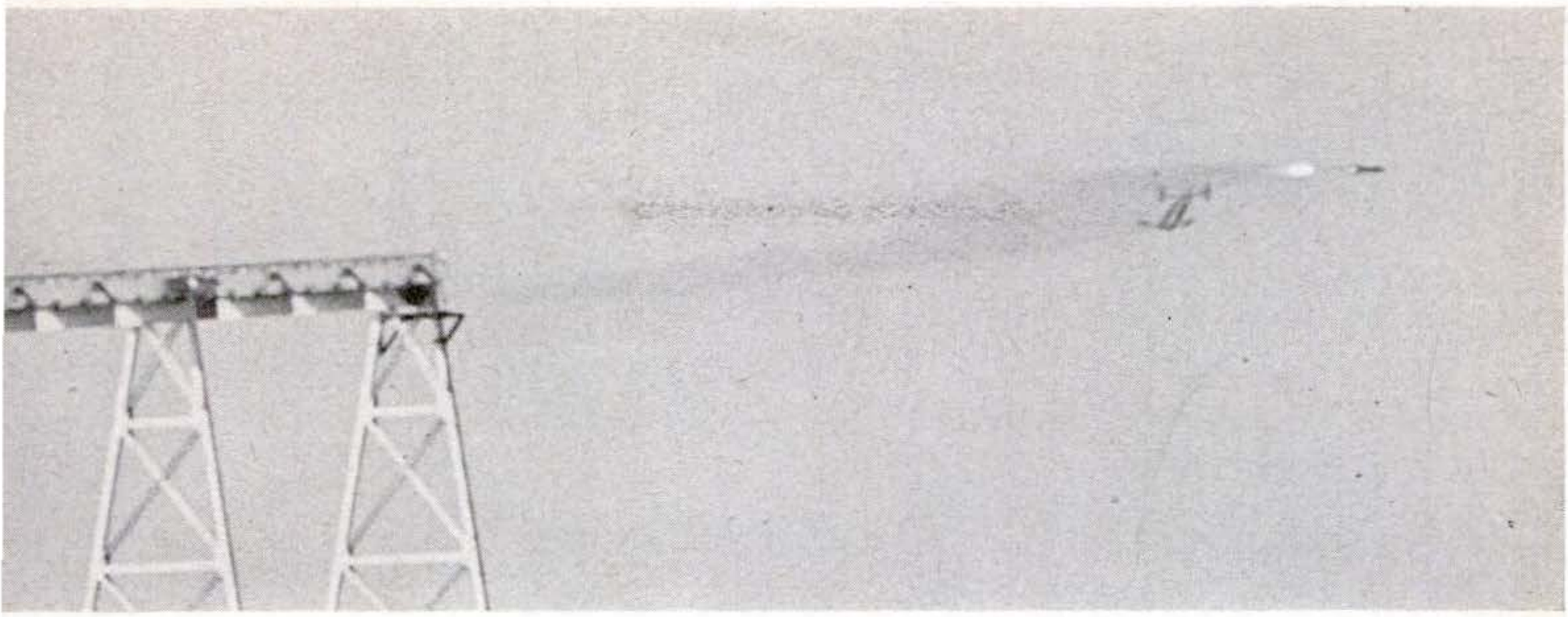
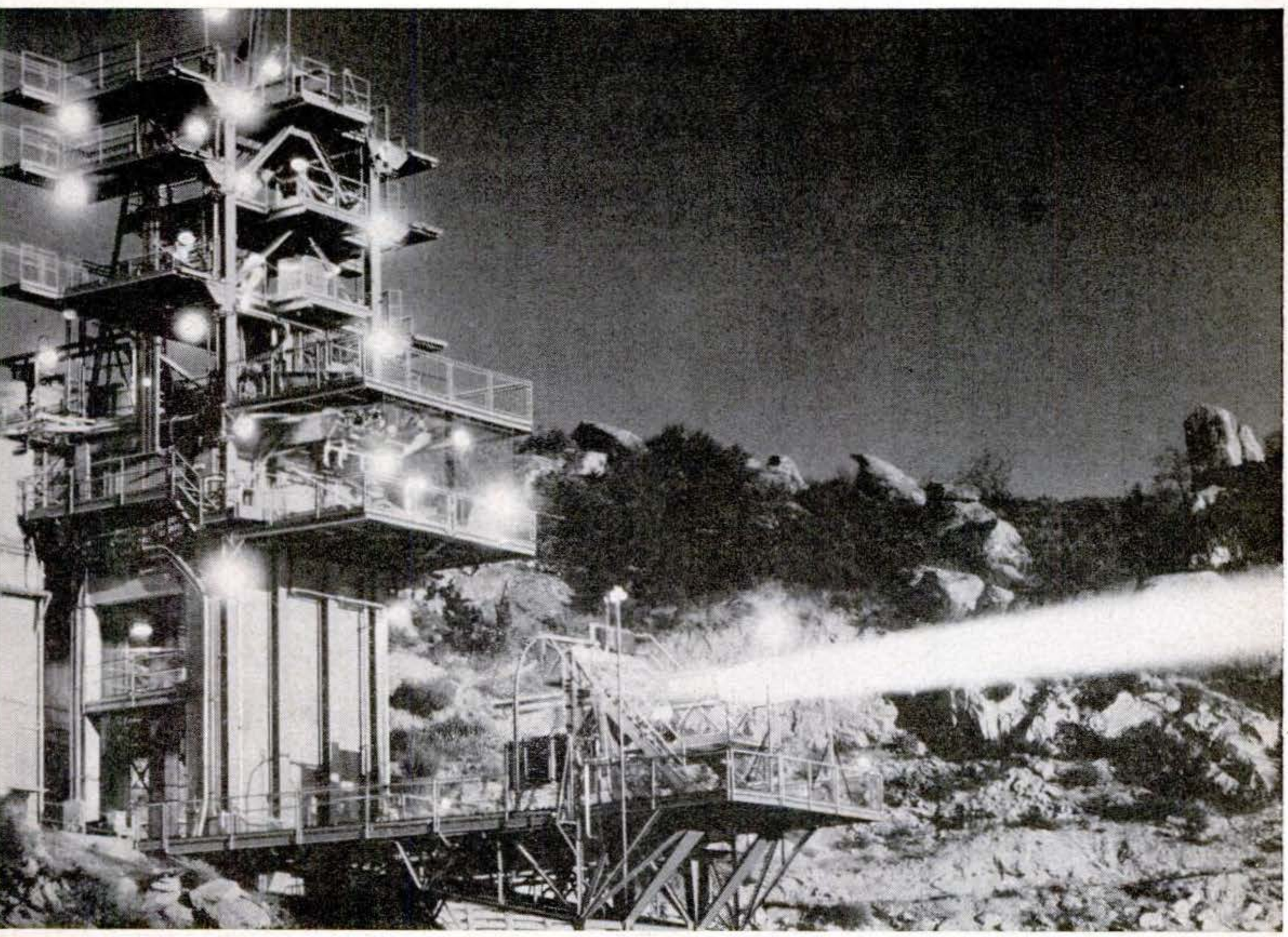


Holy Moses five-inch rocket drops booster (upper right), is off at 1,200 m.p.h. over desert.

THE deadliest rockets in our arsenal are scaring jack rabbits and rattling mountains as they undergo top-secret tests in California. A potential air-to-air missile roars along an inclined railroad track at Inyokern. It leaves the launcher at 500 miles an hour, quickly hits 1,200. On a two-mile level track other rockets put on their show of power for cameras and recording instruments. In the Santa Susana mountains new rocket motors scream through their paces in the world's biggest test stand—a seven-story tower. Now an 11-mile-long test track is being built at Inyokern.



Rocket motor on North American Aviation test tower lights up Santa Susana mountainside.

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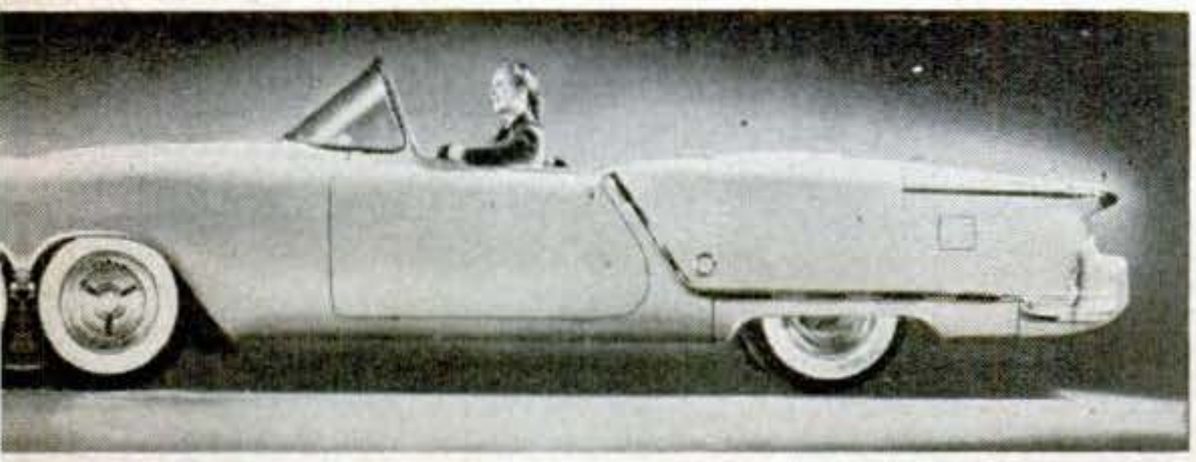
FANCIEST of single-copy GM cars, Cadillac's Le Mans is 5½ inches lower than standard Caddie convertible. It has embossed-leather seats, needlepoint rug, 250-hp. engine.

MOST STREAMLINED is Buick's Wildcat, trimmed in green leather. Only 51 inches high overall, it has perforated front wheel disks that remain stationary while wheels revolve.



ROOMIEST is Oldsmobile Starfire, seating six. With plastic-Fiberglas body, car has 200-horsepower V-8 engine, automatic transmission, power steering, power braking.

MOST REGAL is Pontiac Parisienne, built on town-car lines. Body is jet black, interior trim pink cowhide. Right front seat moves forward 11 inches for easier access to back.

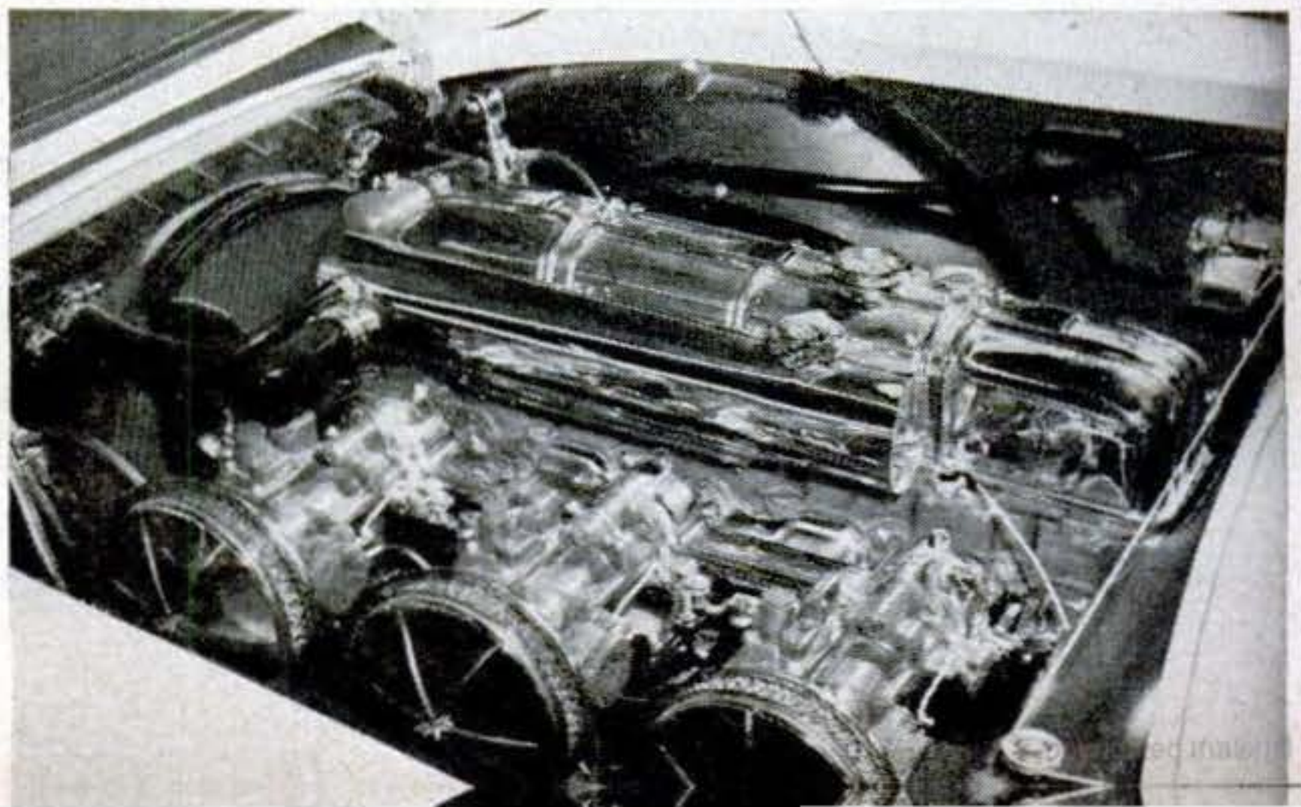
In best Continental tradition, Chevrolet sports

Chevrolet

DON'T look now, but Chevrolet probably will be producing a sports car in the near future.

Low-slung, packing 160 horsepower, an "experimental" Chevrolet with European lines is being exhibited at motor shows around the country. It will be put into pro-

THE CORVETTE, as Chevvy calls it, has standard six-cylinder engine souped up to produce 160 horsepower. Three carburetors feed it.



car has flowing fender lines cut out to show all of the wheels. Notice lack of regular bumpers.

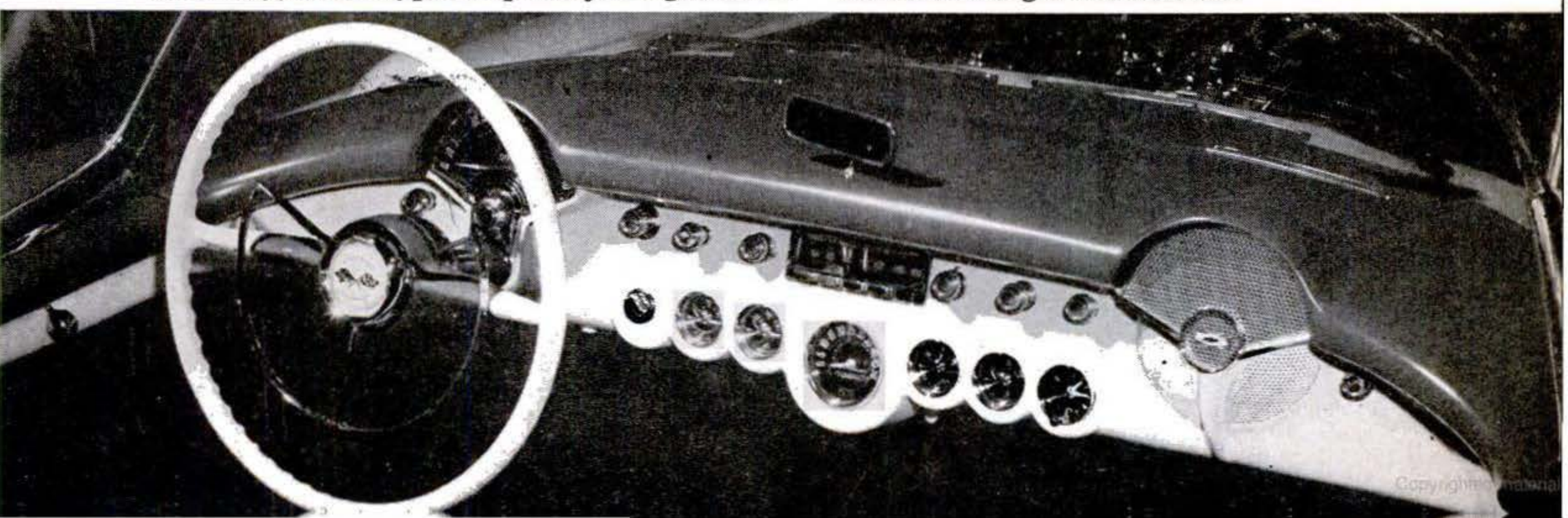
Shows Plastic Sports Car

duction, says the company, "if there's a demand for it"—and the demand so far has been astonishing.

The Chevvy is one of five new experimental automobiles put on display by General Motors. The other four, built by Cadillac, Buick, Oldsmobile and Pontiac, are shown in the left-hand panel on the facing page. All but the Pontiac have plastic bodies. None but the Chevvy has much chance of being produced for sale.

While Chevrolet has dodged all questions on price, the company is said to be aiming at "around $3,000" for its sports car. END

THERE'S A TACHOMETER on the dashboard (large circular dial in center of photo below), naturally, and a typical sports job's gearshift lever, pencil-high, placed between the two seats. Interior of the Corvette is trimmed in white and bright red leather.



Stamps Show World's Cars

PHILATELISTS who happen also to be auto enthusiasts treasure these stamps as collector's items. Issued by nations on both sides of the Atlantic—and of the Iron Curtain—they all have one thing in common; they depict some kind of automotive vehicle—fire engine, ambulance, bus, truck, jeep, horseless carriage or racing car.

In addition to the stamps shown here, other auto-commemorative issues have been printed by Romania, Bulgaria and Spanish Morocco (all three picturing trucks), China (a mail bus) and Italy (the annual Turin Auto Show).

Stamps courtesy *Ethyl News* and the AAA.

THE FIRST postage stamp picturing an auto was a four-center issued by the U.S. in 1901. The two men are driving past the Capitol in an electric car.

FINNISH STAMP features speeding ambulance. Finland has also paid postal tribute to the movement of mail by motor truck.

60-KOPEK RUSSIAN ISSUE of 1941—the year Hitler invaded the USSR—salutes automobile production, and industry and aviation in addition.

ONE OF A SERIES, this Yugoslavian stamp was issued to commemorate the racing-car and cycle competitions which were held in Belgrade in 1939.

SWITZERLAND, like Finland, has issued stamps honoring the postal service itself. Above, a parcel-post carrier. Current U.S. Special Delivery stamps also feature a mail truck.

PANAMA ISSUE of 1947 notes the 50th anniversary of the founding of the Colon Fire Department. Fire engine is American; stamp was printed in London.

GERMANY ISSUED a stamp series for the 1939 Berlin Auto Show. They ran the gamut from high-wheeled horseless carriages (above) to high-powered race cars.

THE UBIQUITOUS JEEP turned up on a 1945 Liberia issue showing President Roosevelt reviewing U.S. troops at Monrovia, Liberian capital, during his visit to Africa in 1943.

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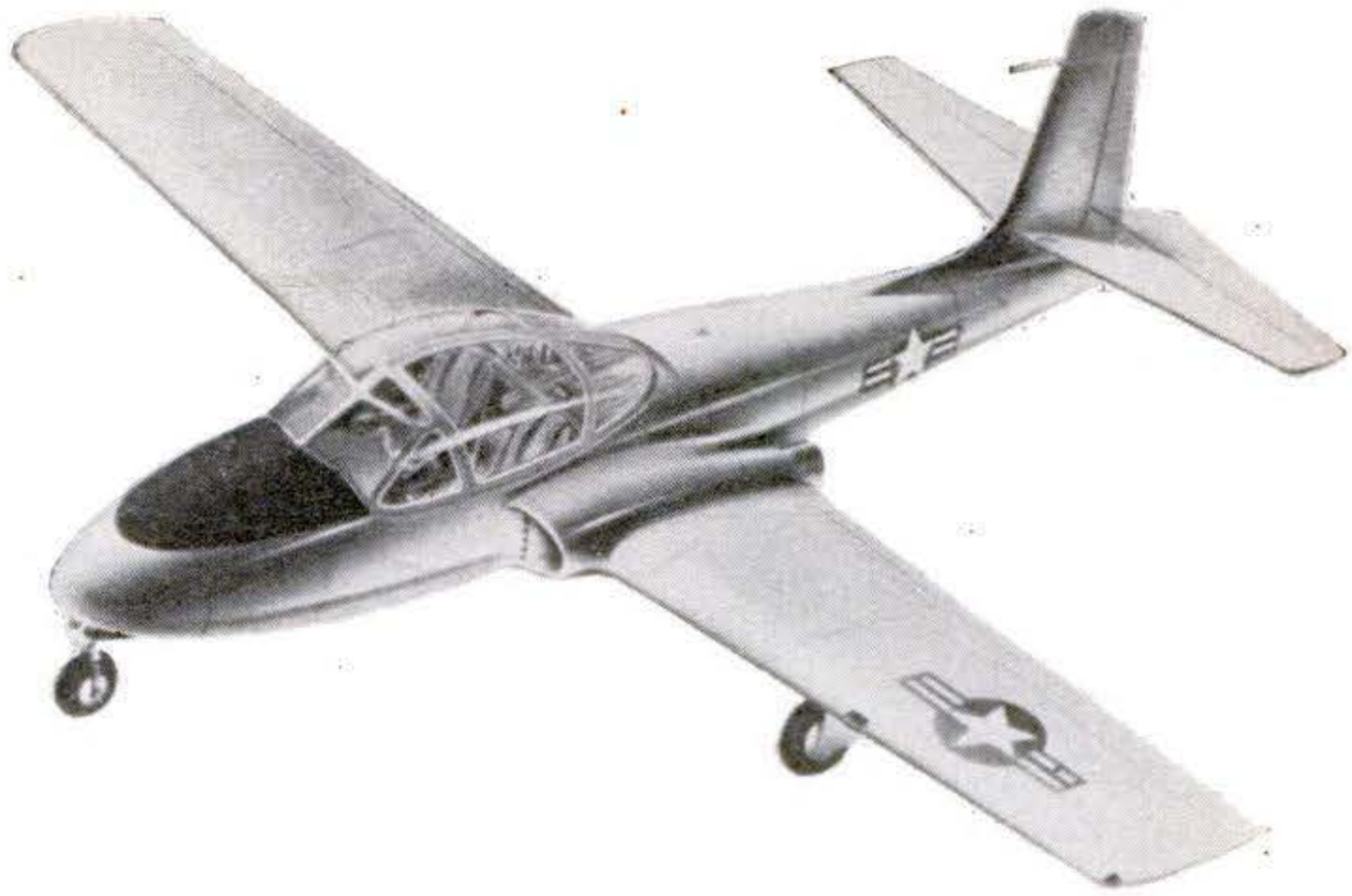
'Kindergarten' Jet to Train U. S. Pilots

U.S. AIR FORCE cadets will soon be flying twin jets in primary training. A contract has been awarded to Cessna for development of the all-metal, two-place job shown in the drawing at right. Powered by two 900-pound-thrust French turbojets built in the U.S., the plane will have a speed of more than 400 miles an hour. It is the first trainer-designed jet.



New Navy Plane Designed to Hunt Subs and Sink Them, Too

DOUBLE trouble is in store for hostile submarines when this new air weapon joins the fleet. It is the carrier-based Grumman S2F-1, which combines in one plane the dual role of search and attack. At present a team of two planes is used for the job. The twin-engine plane has the latest electronic navigation and detection equipment.

Five-M.P.H. Take-Off Is Forecast for Channel-Wing Plane

A NEW, all-metal version of the much-discussed Custer channel-wing airplane, which is expected to take off at five miles an hour and cruise at 250, is planned for production after a prototype has completed flight tests. The production model will carry five passengers.

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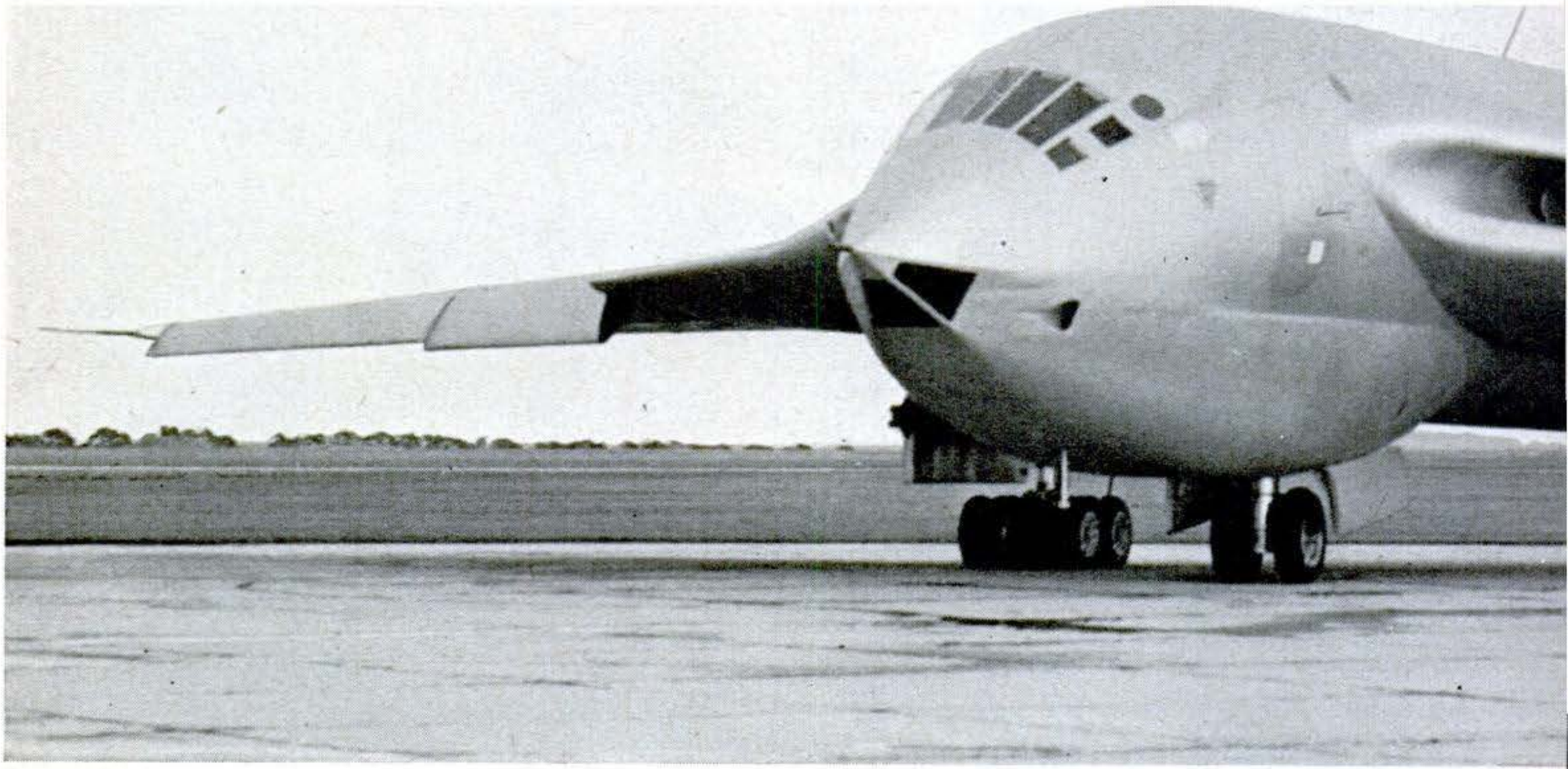
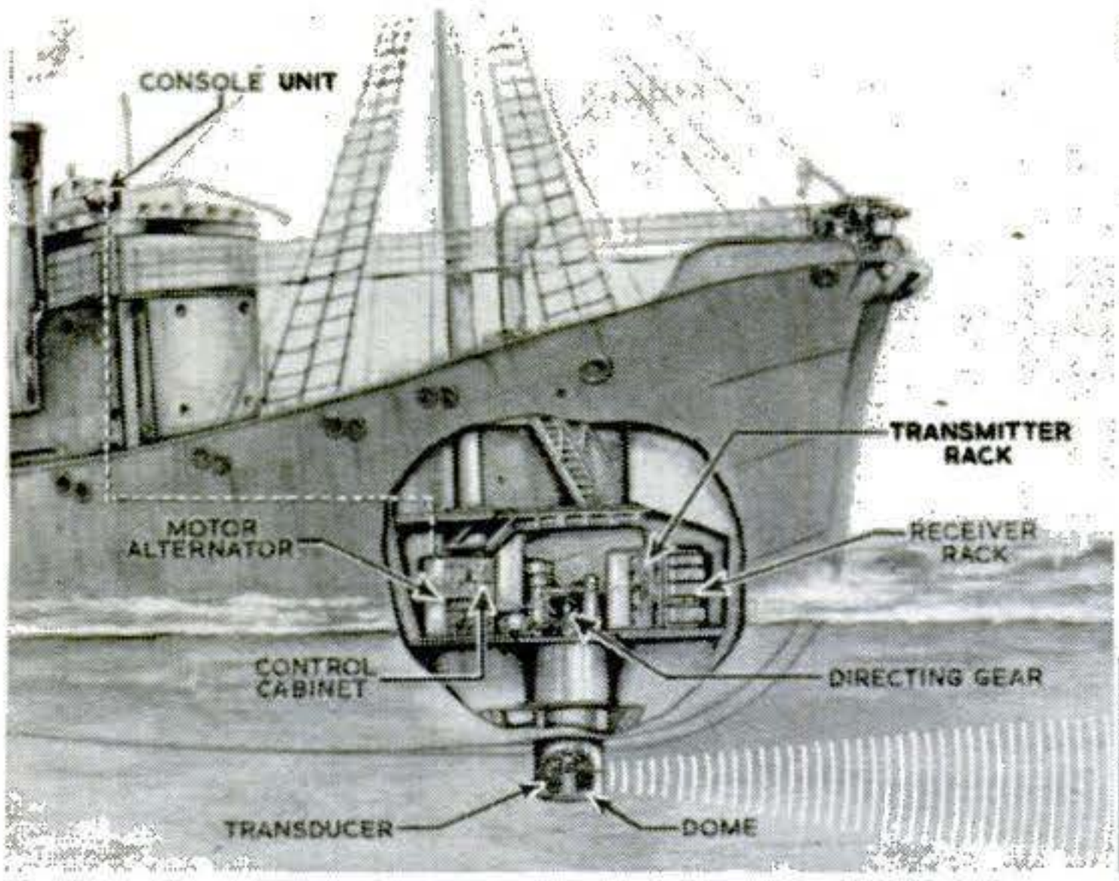
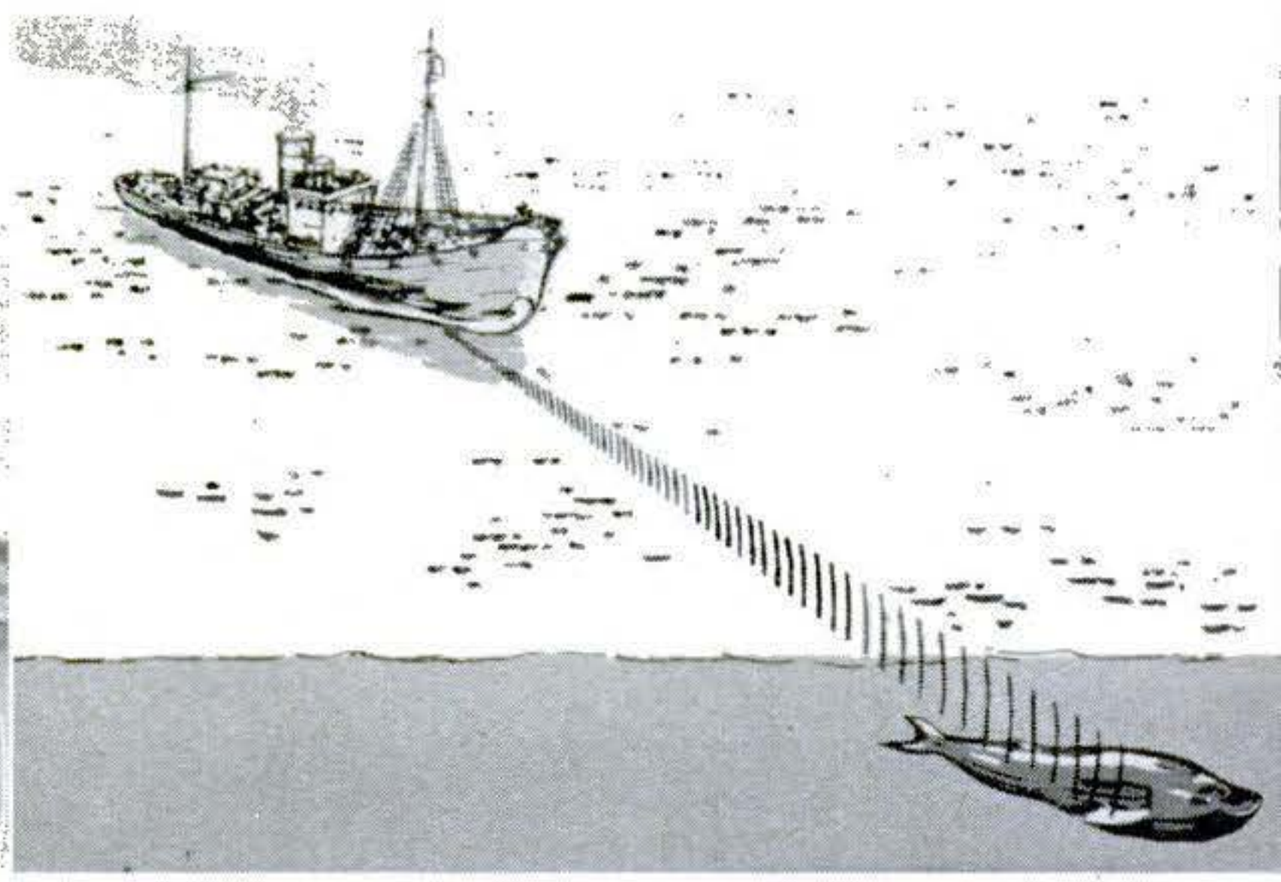


British Bomber Gets Brand-New Crescent Wing

BRITAIN'S latest bomber is this Handley Page 80, just off the secret list. Its four Sapphire jet engines, buried in a crescent-shaped wing, develop more power than 10 World War II heavy bombers. Speed is reported at around 600 miles an hour.

The new wing shape combines the merits





1953 Harpooner Gets a Break as Underwater "Radar" Spots Whales

FROM 11 whaling vessels in the antarctic this winter, searchlights of sound peered into the frigid water for the harpooners. These vessels have been fitted with sonic whale detectors (sketched above).

Here's how they work: As soon as the lookout on a ship sights a school of whales, a retractable dome lowers a transducer from the hull to fan out a beam of sound. A submerged whale caught in the beam bounces back the sound. The time between transmission and echo, translated into distance at a console, pinpoints the target.

Similar sound-ranging systems—developed first to detect submarines—are widely used by commercial fishermen to locate their catch. The whale-fishing equipment was made by Kelvin & Hughes, Ltd., of England.

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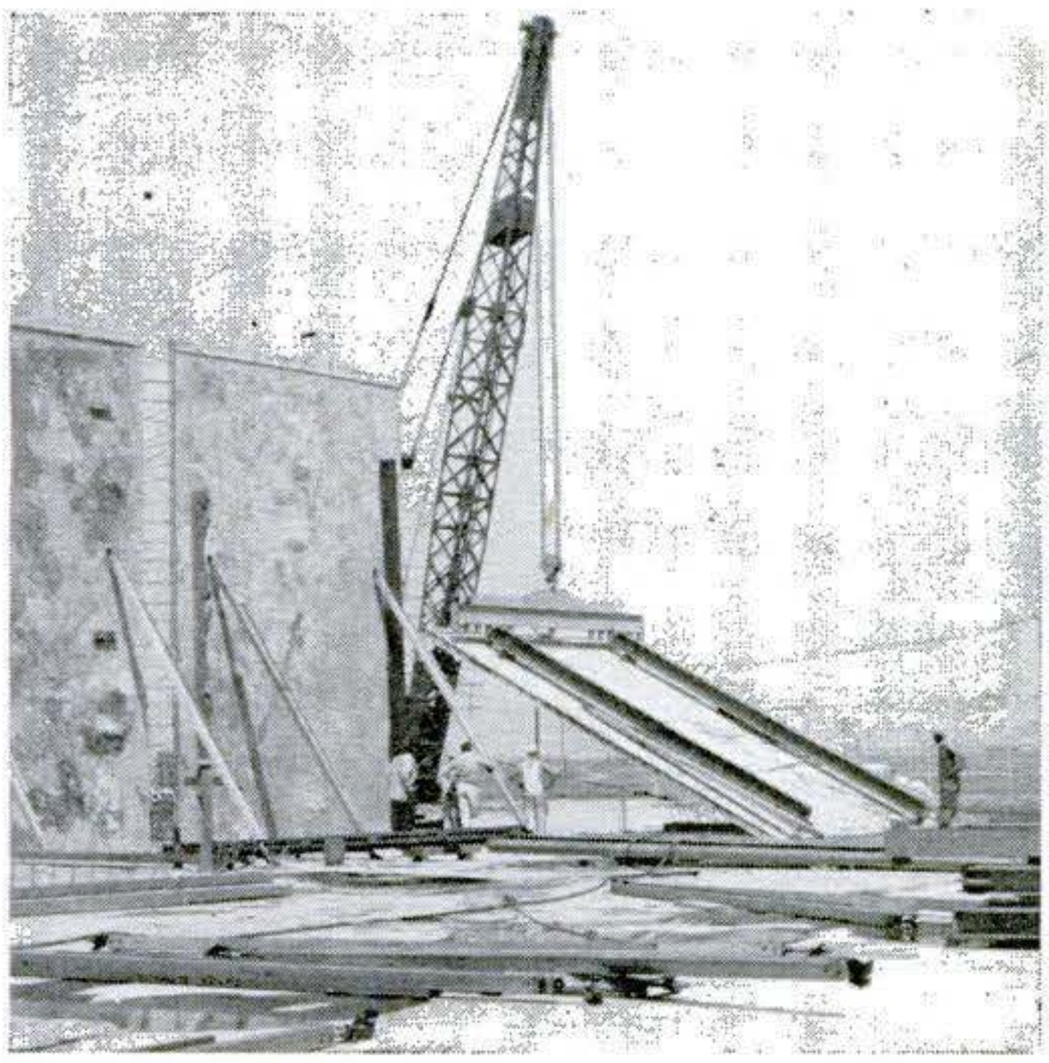
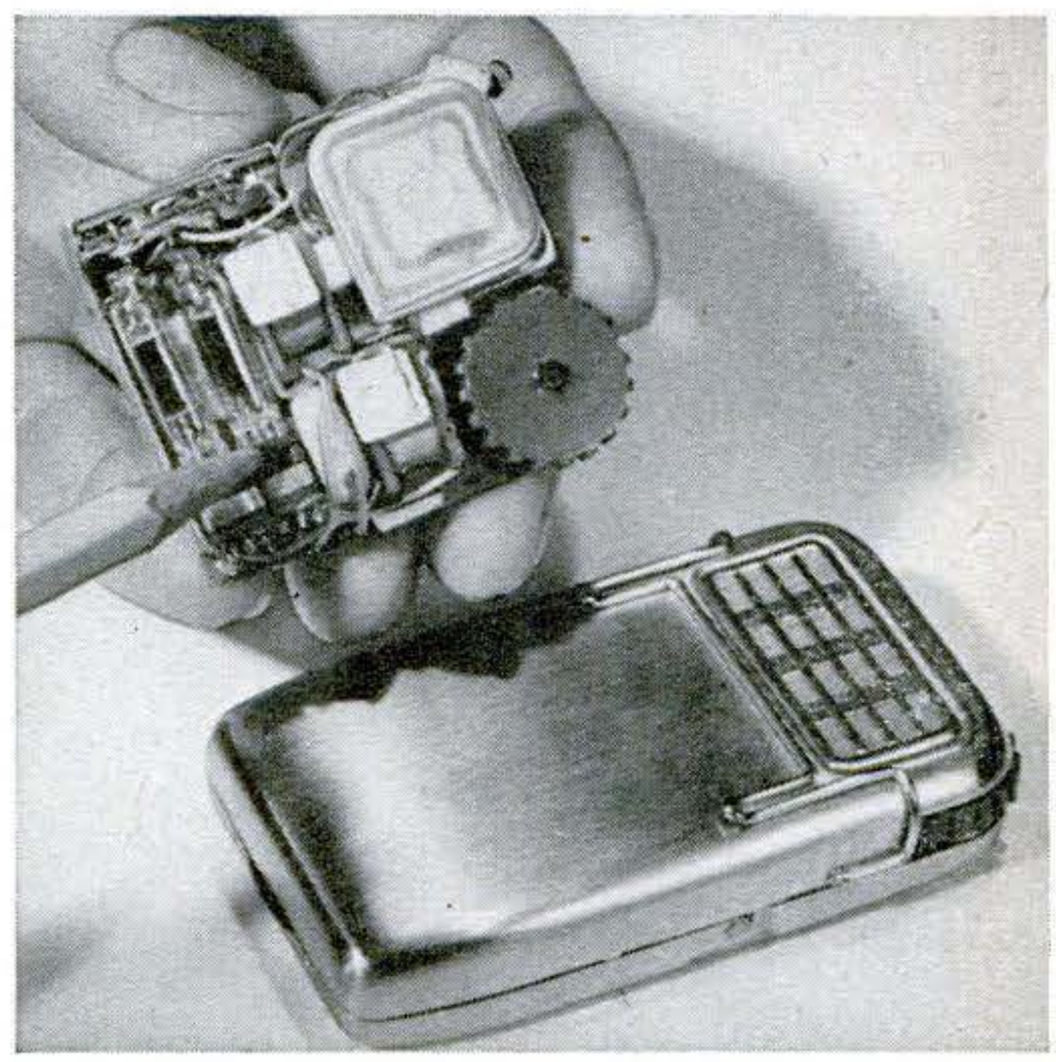
of the delta, the swept-back and the razor-thin straight wings, but adds a trick of its own. There is a sharp sweep back at the thickest sections close to the fuselage. Then it turns out again so that the thin tip sections are nearly at right angles to the line of flight. This shape is said to give greater maneuverability and stability at low speeds.

Two main undercarriages spread the bomber's weight over a large area to allow operation from runways of normal strength. Next Month: Popular Science will compare this bomber with the latest U. S. design.



Big Walls Put Up Fast

WALLS 28 feet high and six inches thick are shown above being crane-hoisted into place during tilt-wall construction of a United Air Lines base at San Francisco. Poured in molds at the site, the slabs of reinforced concrete weigh 19 tons each.



Transistor Put in Hearing Aid

THE transistor, tiny powerhouse of germanium in plastic, is used in the Sonotone hearing aid above. A pencil points out its location next to two miniature vacuum tubes. The transistor, adopted by several makes of hearing aids, reduces battery drain.

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How to Watch Roller Derby

Its sock-and-rock-'em mayhem on wheels is more spectacular than it is dangerous, thanks to sound rules and engineering.

By Charles McLendon
PSM PHOTOS BY W. W. MORRIS

MILLIONS of cash customers and free-loading TV fans go mad each year over an atavistic sport called Roller Derby. They believe that its sole purpose is to kill or maim tough-muscled young men and women mounted on flying two-inch wheels. This quaint outlook is pleasing to Promoter Leo Seltzer, because their blood quests will rack up about 5,000,000 paid admissions this season and a hefty revenue from telecasts.

It may surprise many TV-ites to learn that only one derby skater has been killed in the 18 years since Seltzer dreamed up the game while doodling on a Chicago restaurant napkin. The long-range lenses of the TV cameras have been guilty of giving too narrow a view of a sport whose players are protected from serious injury by safety rules and a dazzling assortment of mechanical contrivances.

The TV-ite should also know that players are not hedgehogged with splinters when slammed against the track. Thanks to the most perfect racecourse ever built, the indestructible women who tussle in sock-and-rock-'em violence may safely wear earrings, eyeglasses and hair ribbons.

Slams Are Needed to Score

Roller Derby is the toughest sport in which women compete for scoring points on an equal basis with men. But it is no

"Jams" Are the Essence of Roller Derby—

JAM STARTS on signal of referee's whistle as two players from each team take alternate positions at head of "pack." Lead "jammer" is New York Chiefs' Mary Ciofano.

BREAKAWAY. Chiefs' Mary Lou Palermo (in pigtails) and Jersey Jolters' Julie Patrick are in the clear. They will try to gain a lap on other skaters.

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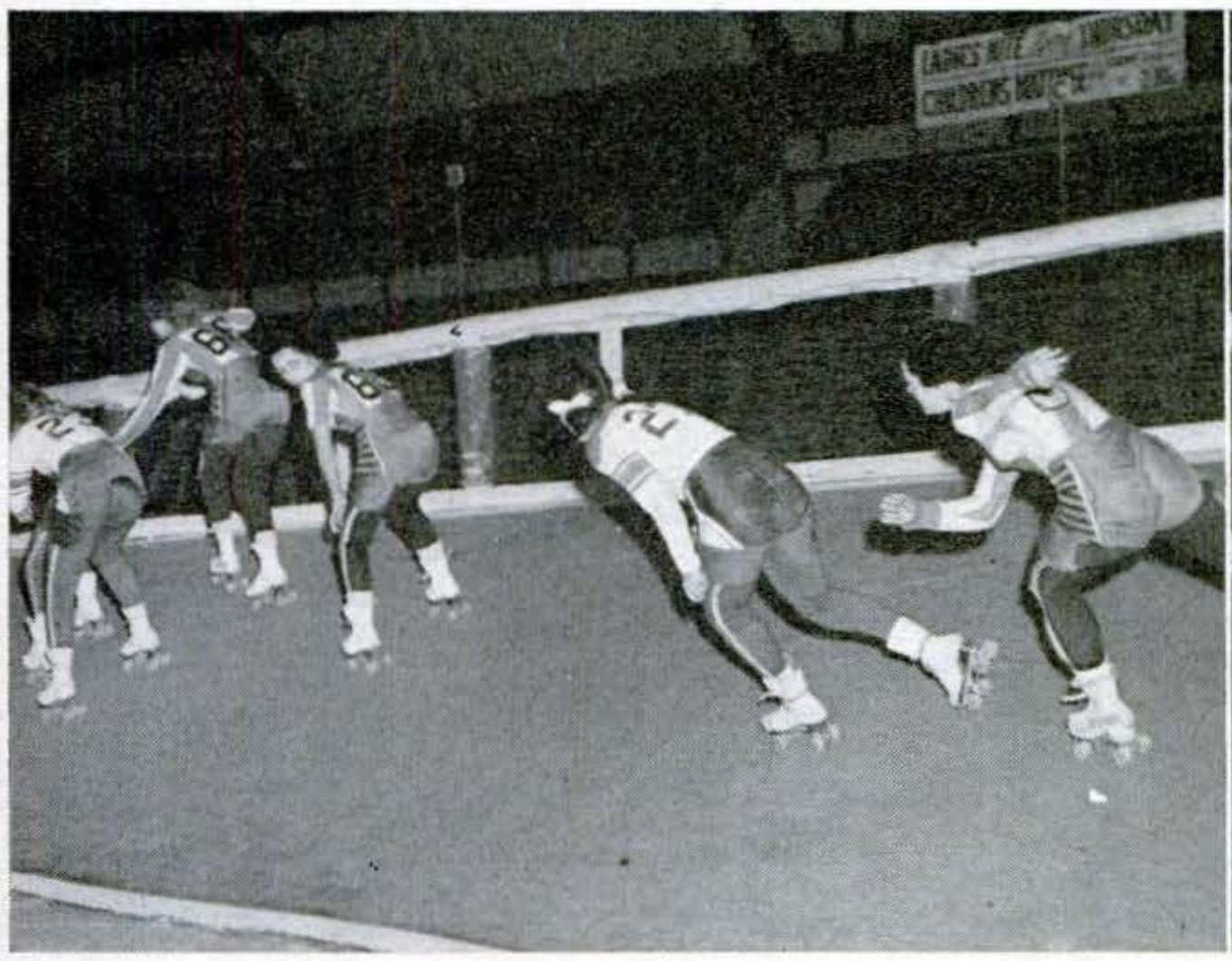
Knockdown by Chiefs' teammates is good for two points by scoring ace Spec Saunders.

90 Seconds or Less of Dizzily Angled Action



CRUCIAL MOMENT. Approaching pack from rear, both jammers are in position to score. Jean Porter has dropped to defense spot for the Jolters, will try to block Palermo.

PAYOFF. Knocked to the rail by Chiefs' Ciofano and McGrath, a Jersey Jolter is passed by Mary Lou to rack up one point. Passing whole opposing team scores five.

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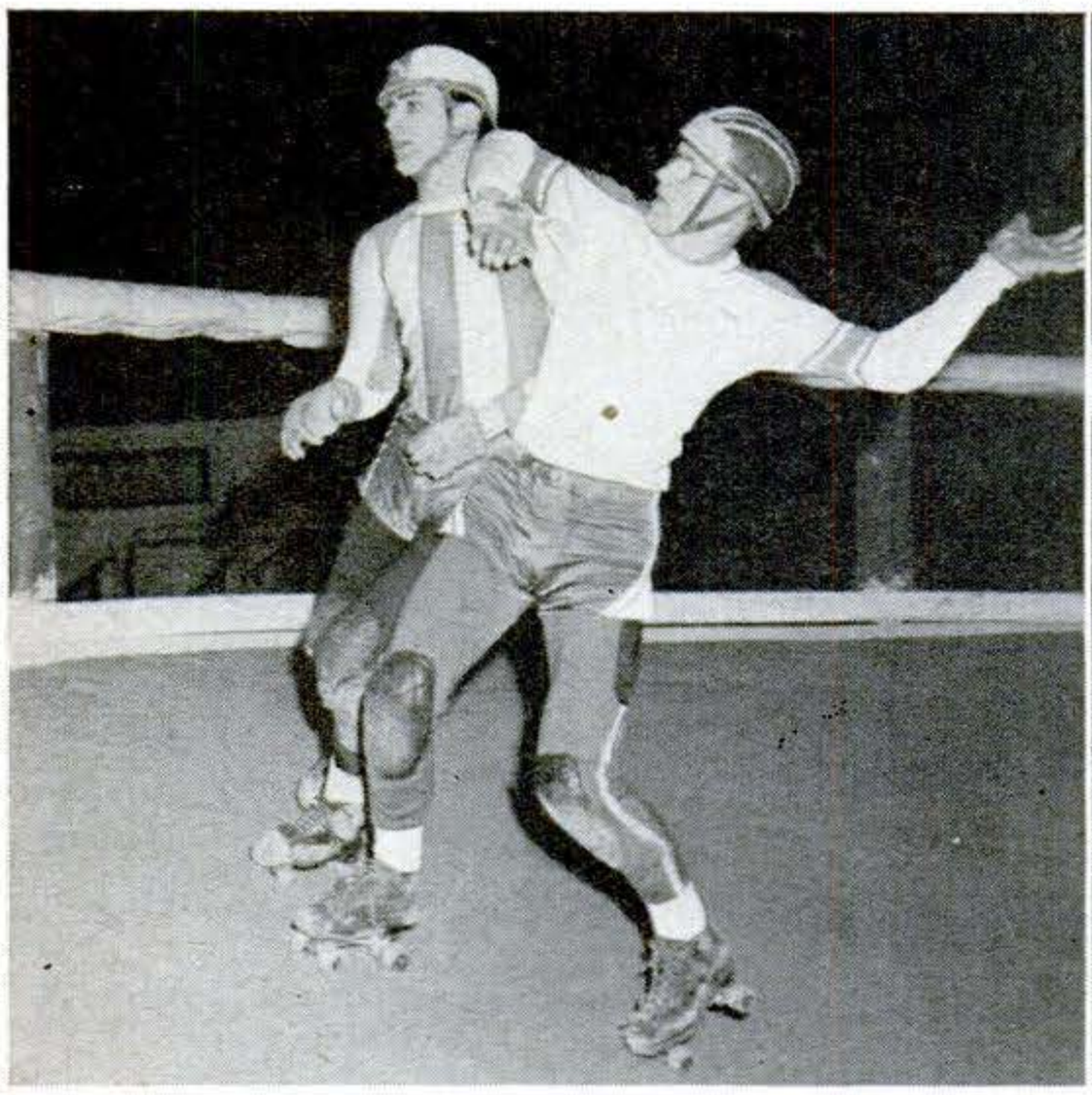
more rugged than football, ice hockey, wrestling or six-day bicycle racing, from which it borrows its most violent features.

The rules are as strict as in basketball. But the fact that no player may score without slamming opponents a dozen times or more in a single play makes Roller Derby one of the most spectacular sports ever devised.

Scoring points result from 90-second holocausts called "jams." An evening's game, divided into eight 12-minute periods, may provoke as many as 40 of these spirited forays and several bone-jerking spills. Five men and five women are a team, with the ladies taking over every other period.

At the shrill of a referee's whistle the 90-second clock starts, and one or two players from each team break out of the

Fair Play or Penalty? These Are Legal



TWO-MINUTE PENALTY results from illegal elbow block, above, demonstrated by Spec Saunders and Jersey Jolters' Hal Janowitz. To make this violence legal, the elbow must be swung below opponent's shoulder, as shown below. Midriff jabs are breath-taking.

SERIOUS INJURY to groin, stomach or chin outlaws leg block with bent knee (above). Spec tries the maneuver again (below) in the manner approved by the referees. A straightened leg sends Jolters' Lou Proto spinning to the hardboard floor.

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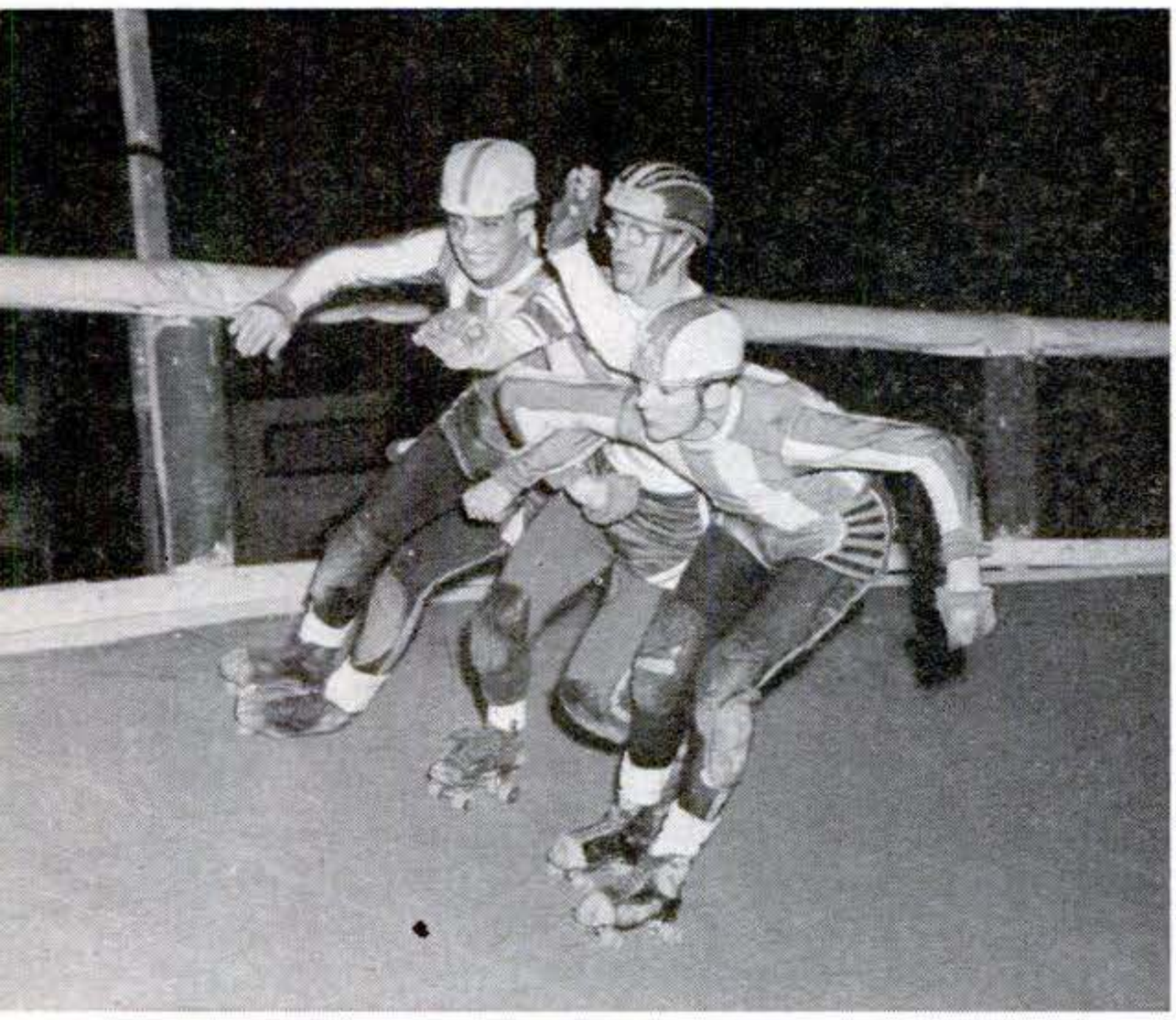
formation in an attempt to gain a lap, crash into the back of the pack and pass as many opposing players as possible. Getting by one opponent is good for one point; passing an entire team, five points. Score-seeking skaters are called "jammers," and the one out in front is the "leading jammer."

The only effective offense or defense is to knock an opponent out of control,

and Illegal "Blocks"



LOCKING ELBOWS in a double block (above) can put both defensive players in the penalty box, increasing scoring chances of the opposition. Or two points may be awarded blocked player. Below, Jolters' Marchese and Janowitz observe the legal niceties.

OOPS! That, my dear, was a hip block, considered essential as a primary offensive and defensive measure. The Jersey Jolter owes her instability to Mary Lou Palermo.

PHONY? TV cynics think so, but most hair-pulling is authentic. Here, former Chiefs' star Gerry Murray exchanges a scalp treatment with Red Devils' Toughy Brasuhn.

SIMMERING. The normally quiet demeanor of Mary Lou Palermo has just been ruffled by a real or imagined wrong, and she's speaking her piece from the penalty box.

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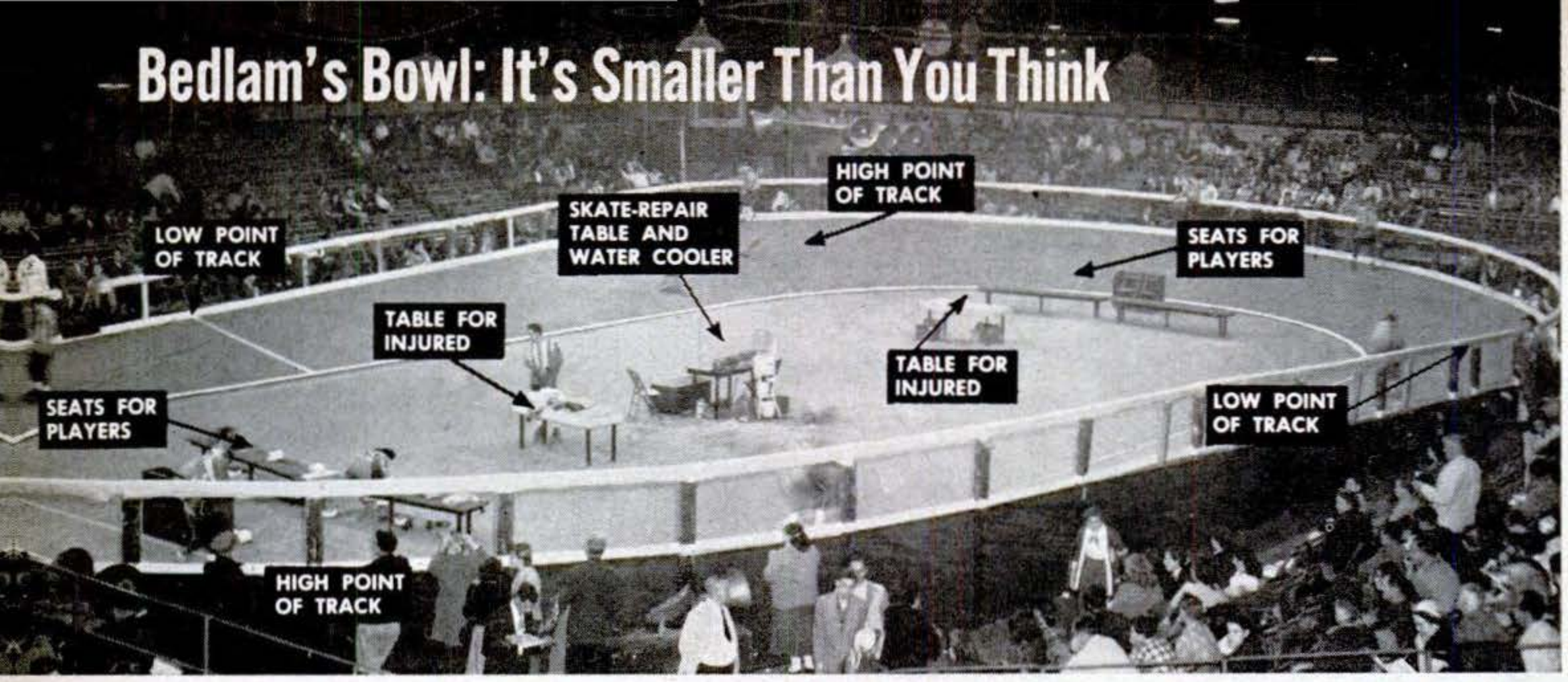
Bedlam's Bowl: It's Smaller Than You Think



TV gives Indianapolis-Speedway look to Derby tracks. Actually they measure 128 by 70 feet.

TRACK CAN BE SET UP or knocked down in four hours. Skating surface is 12 feet wide, with 23-degree end banking. Masonite, on a ¾-inch plywood base, provides "bounce."

SISSY REFINEMENT which has made Derby healthier for players without reducing the showiness of the game is one-inch, sponge-rubber padding on the guard rails.

Roller Derby's Superstitious Cinderella Wears

DERBYITES ARE AS SUPERSTITIOUS about their skates as baseball players are about lucky bats and gloves. Sensational young star Mary Lou Palermo is no exception. Toe-braking has torn the leather from her shoes, but she won't give up the battered brogans.

NOBODY TOUCHES her magic skates but Mary Lou herself. An artist with the abrasive wheel, she grinds down a new set of wheels, then removes a couple of ball bearings and adjusts the axle-bearing keeper loosely. She thinks slight friction improves control.

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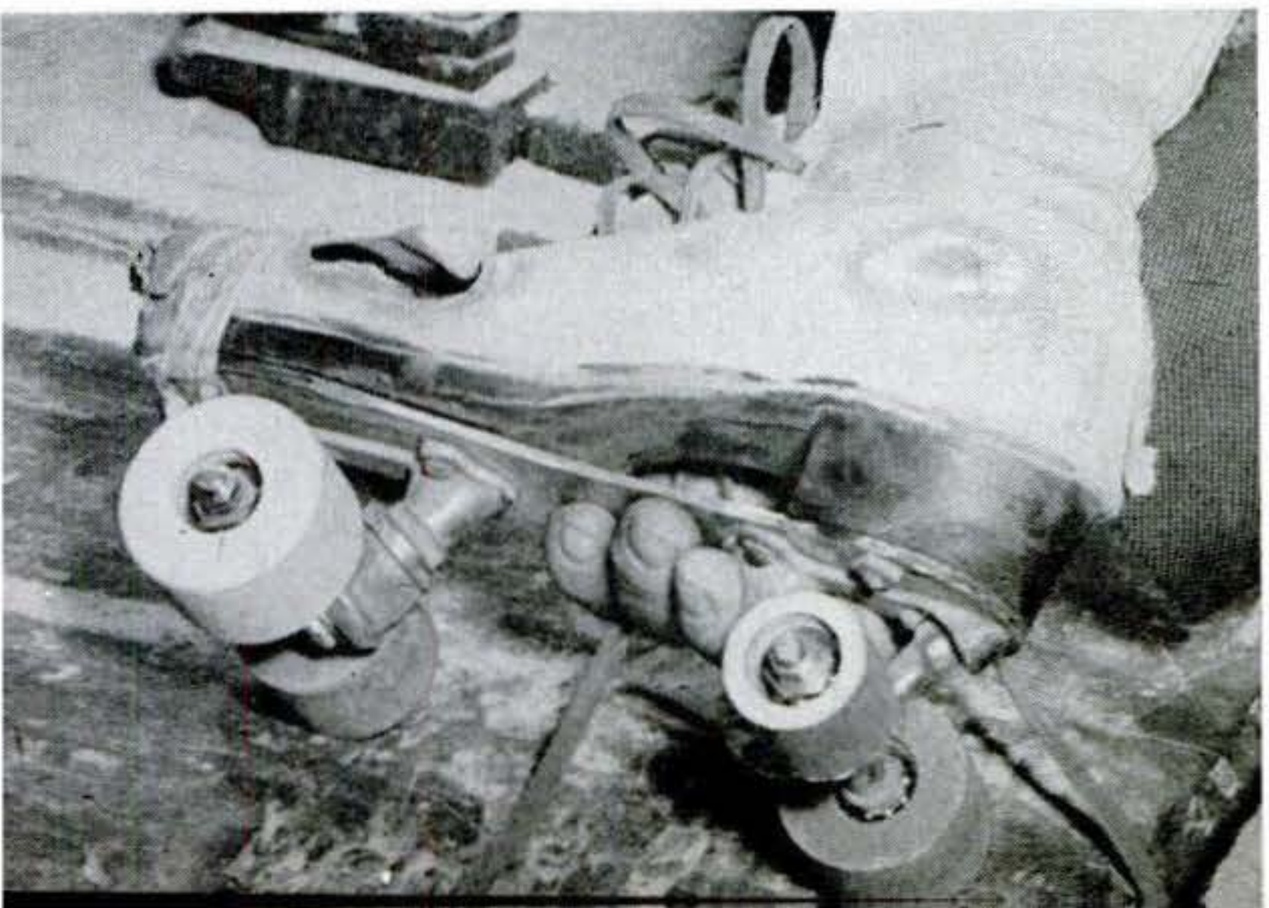
Point-gaining "whip" boosts speed of jammer from 35 miles an hour up to a dazzling 45.

onto the floor or over the rail. A leading girl jammer who scores a few points by slamming opposition players helplessly against the rail receives cheering homage from an audience which is 65-percent women. Both male and female contestants wear tights padded about the knees and thighs, and the girls fill the seats of their shorts with sponge rubber. Seltzer supplies all players with tough plastic helmets, which are usually discarded.

These Shabby Skates

FOR DEMONSTRATION ONLY. New two-inch wheels (left) make most players feel they are on stilts, so they grind them down to 1½-inch diameter. The whirling maple discs last about a month—16 games—traveling 200 miles before becoming nubbins (right).



Players Accept Injuries

Nearly all skaters admit to a long list of painful injuries, but laugh them off, maintaining that they are an acceptable hazard of the sport. Playing part of a game with chip fractures in both shoulders and one ankle, Mary Lou Palermo, a star of the New York Chiefs, cried because her blocks lacked punch.

None of today's Derbyites will wear the number 1. They consider it bad luck, remembering a day in the late Thirties when Stewart Erwin, carrying an eight-inch 1 on his back, was killed in a fall against the inside edge of the track, which had been elevated six inches above the arena floor. This hazard was eliminated the next day by lowering the track to the floor.

Practical experience, never again so

[Continued on page 276]

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P.S.

Last minute news & notes...

SKIDDING may be prevented when buses and trucks stop quickly by a device being developed by Goodyear. Similar to a system in use on aircraft and passenger trains, it senses when a wheel is about to lock and slide, eases off on braking pressure enough to keep the wheel rolling.

ENGLISH VIDEO FANS are eventually to be rid of interference from cars. Static-preventing suppressors will be compulsory on all new autos, motorcycles and motorboats sold there after July 1.

A MILLING MACHINE run by an electronic brain at MIT is turning out one complicated jet-plane part every four minutes. It took human operators 30 hours to make the same piece.

ANCIENT ROMAN RUINS in Britain may yield a secret that will help keep iron and steel from rusting. Excavations in York have revealed 2,000-year-old knives and hobnails in perfect condition. Government scientists believe that tannin in the soil may have prevented corrosion.

MORE THAN 400 TIMES AS FAST as the lens of a box Brownie (about f/16) is an f/0.75 movie-camera lens designed by Kodak. Its almost incredible light-gathering power, close to the theoretical optical limit of f/0.5, is intended for "cine-fluorography"--making motion pictures of the faint images on fluorescent screens.

WEEK-END PAINTING becomes easier with a wall primer that dries in 45 minutes to two hours, after which a flat wall finish may be applied. It is a water emulsion of polyvinyl acetate and has no odor, du Pont reports.

A SWITCH ON HYDRA-MATIC TRANSMISSIONS is provided in Rolls-Royces shortly to be seen in the U.S. Instead of the dual range provided in American cars, the motorist has three quadrant settings to select from. The lowest allows one gear up shift; the second, two; the third, three.

SOLAR-ENERGY CONVERSION and photosynthesis, the process by which plants harness sunlight to manufacture food, will occupy researchers in a great new laboratory to be completed this year at Yellow Springs, Ohio, by The Charles F. Kettering Foundation.

COLD RUBBER, modern triumph of synthetic chemistry, can now be made in 15 to 20 minutes instead of the 10 to 12 hours currently required. The new Goodrich process will permit continuous production in stainless-steel pipes--instead of by batches in expensive pressure vessels.

FRIDAY THE 13TH--there's one this month--is luckier for motorists than Saturday the 14th, says the National Safety Council. More accidents occur on the latter date, it points out, simply because there's more traffic on a Saturday. Last year, 21 percent of all fatal motor accidents were on Saturdays, Sundays running a close second.

FLOWER PATTERNS resembling Christmas poinsettias, seen in samples of Diesel fuel oil under an electron microscope, warn Denver & Rio Grande Western Railroad men of trouble--unless a chemical called a dispersant is added before use. Otherwise, gummed-up piston rings and lacquered cylinders will result. Predicting how Diesel oils will behave by patterns of spots, an RCA table-model electron microscope has enabled the railroad to avert locomotive repairs, reduce smoke and cut fuel bills.

SNAKEBITE-PROOF TROUSERS for hunters and campers have heavy canvas legs with detachable linings of lightweight, flexible Monel-metal wire cloth. The maker, Gokey Co. of St. Paul, says they are impenetrable to snakes' fangs.

The Editors

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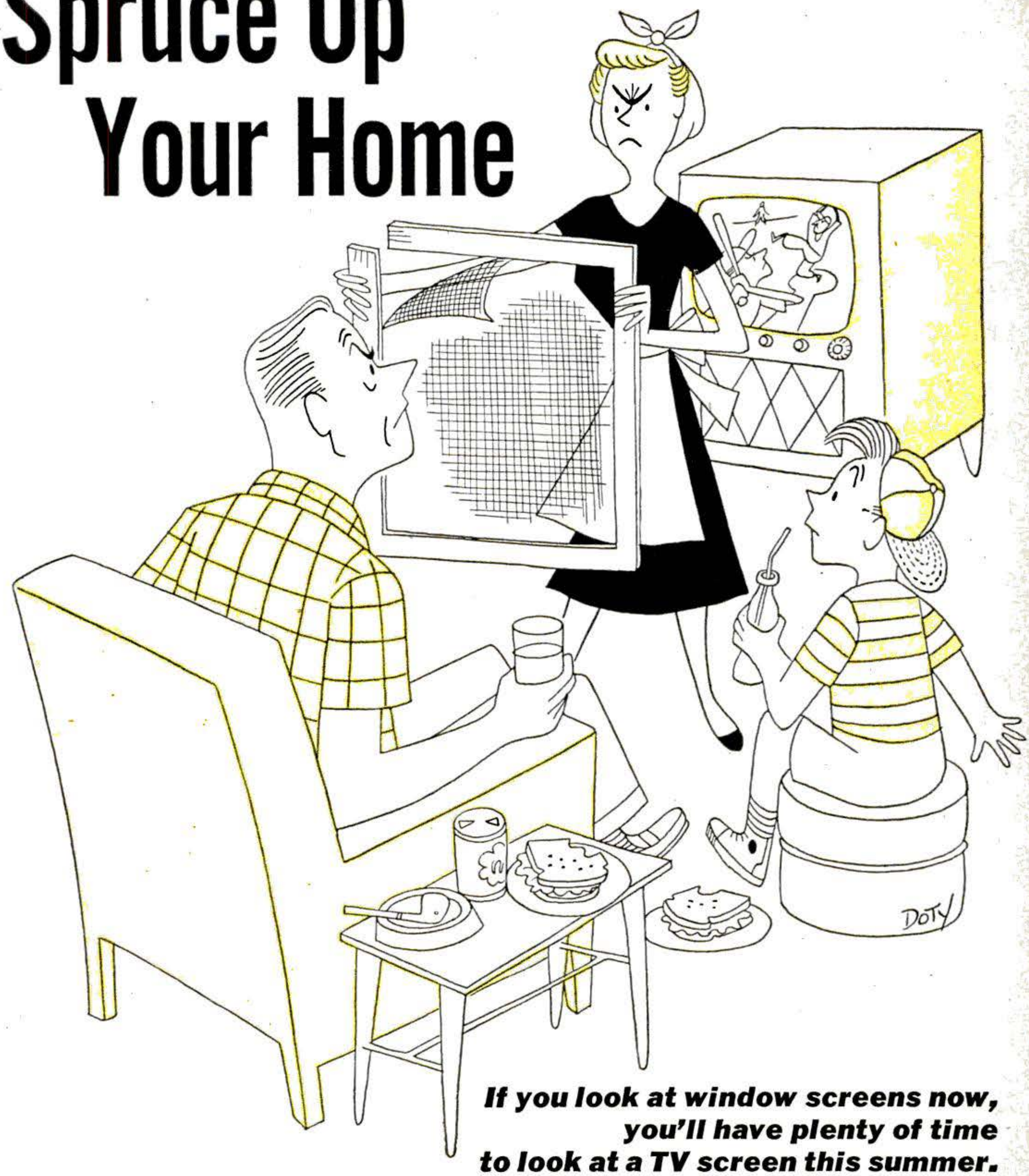
Now's the Easy Time to

Spruce Up Your Home



If you look at window screens now, you'll have plenty of time to look at a TV screen this summer.

By Bernard Gladstone

I GUESS that I took the pledge on house repairs on that warm June day two years ago when the Cardinals were at Ebbets Field. I was sprawled out on the lawn listening to the game on the radio.

The Dodgers were up in the last half of the ninth, the score was one-all, and there were none down and the bases loaded. Robinson had singled, and Ted Wilks had walked Snider and Gil Hodges.

"Here's the pitch—" said the announcer.

At that point the missis called from the doorway. "Dear," she said, "when are you going to mend the screens? The wire on one—"

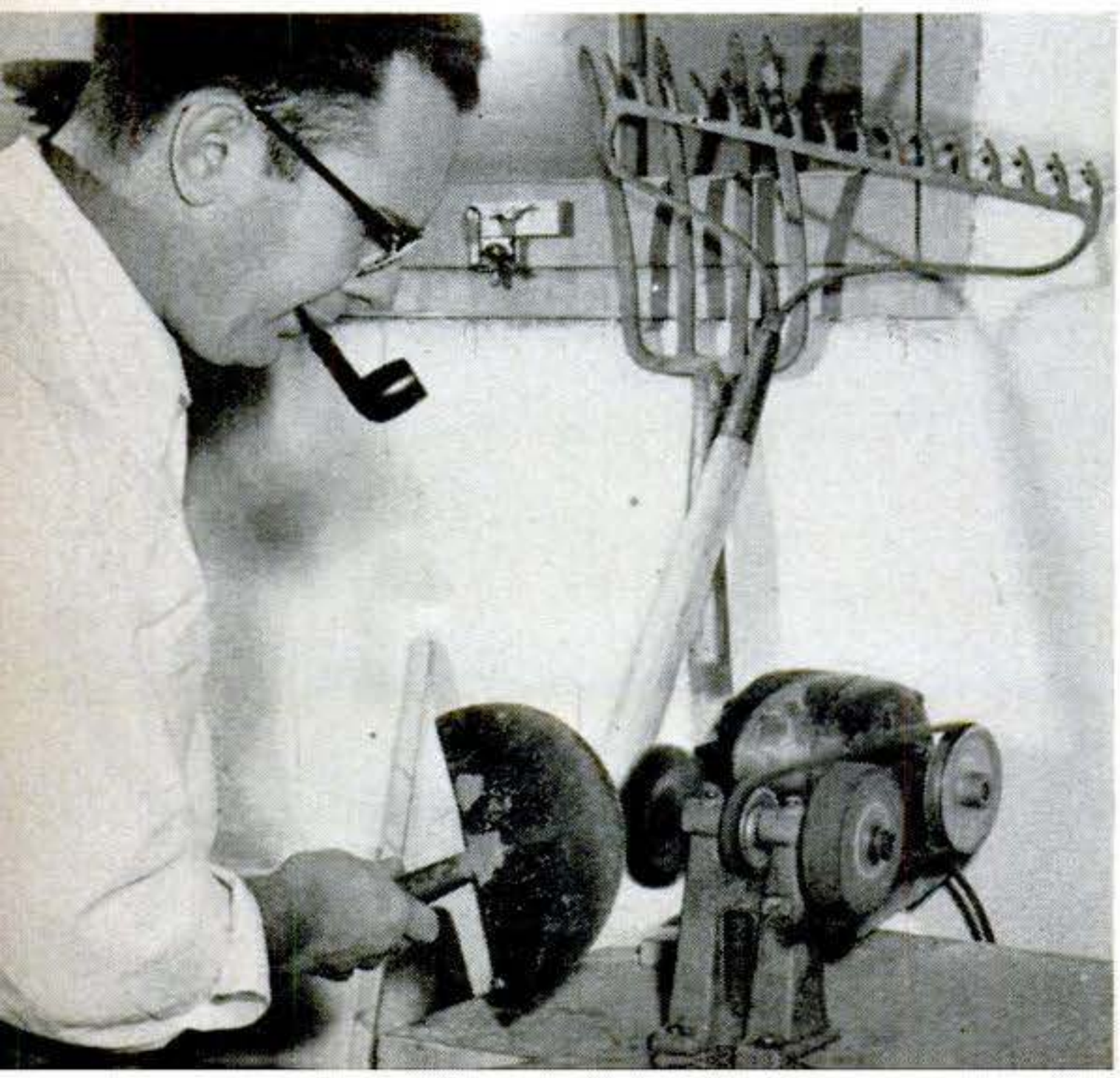
"—and there," yelled the announcer, "goes the ball game!"

Well, what can a man do? I got up off the lawn and went to work on the screens. The only way to whip this problem is to get the house fixed up before the pennant races start to get interesting. I've found a formula, and I'm going to explain how it works.

Take a spring examination of your shingles, for instance. Most homeowners put that off because they make too much work of it. I've simplified it. On the first warm day I look over my roof from the ground.

IF YOU WANT TO SIT DOWN when summer comes, better start fixing the chairs now. A coat of paint and new canvas seats, an easy tack-on job, make lawn furniture like new.

SHARP TOOLS work faster than dull ones. Grind or file a keen edge on hoes, shears, edgers and other cutting tools and you'll spend less time in the garden. Oil helps, too.



It doesn't take 20-20 vision to spot a raised shingle. I supplement that with a quick trip through the attic. Any dripping that has developed during the winter is obvious.

In the garden-tool department I make quick work of pruning shears, turf edgers and the like. They're already clean, for one thing. I put them away in the fall only after I've gone over them with a wire wheel or steel wool to remove caked dirt and rust.

Keep Tools Sharp

The short cut is in sharpening them. The only part of a garden tool that does any work is the cutting edge. So I limit my labor to sharpening the edges with a flat file or grindstone. I don't knock myself out, either. Shovels, edgers and hoes don't have to be razor-sharp.

To tighten up the rivets on the wooden handles on shovels, rakes and other long-handled tools, lay them across the anvil of your metal vise and whack them with a hammer. That's only a 10-minute job between supper and the Milton Berle show.

This month—March—is the time to lubricate your wheelbarrow, spreader, sprinkler, lawn mower and other pieces of equipment with moving parts.

Get yourself a chair and a low table to work on. Use a trigger-type pressure oil can. It's easier. And *don't* use lightweight oils and greases. The heavier weights last the whole season.

It's a good idea to give all your equipment a coat of enamel to protect it.

I advise fixing the lawn and patio furniture before the exhibition games start. Some of them are bound to be on TV.

Wives Are Handy

First, wash the stuff down. Once the items are clean and dry, paint them. I do all my painting with a spray bomb. It's a lot faster.

If you have to do any gluing, use the ready-mixed kind. If you have to do any sewing, use your wife. Paint will do wonders for old canvas. And repairs don't necessarily mean removing the old material. Lots of times you can tack a new piece right over the old. And use a stapling gun. It's a great labor saver.

Natural-wood furniture should be protected with a coat of penetrating sealer. The easiest way to apply this is with a boy around the age of 10. When they're older a quarter of a dollar doesn't look so big to

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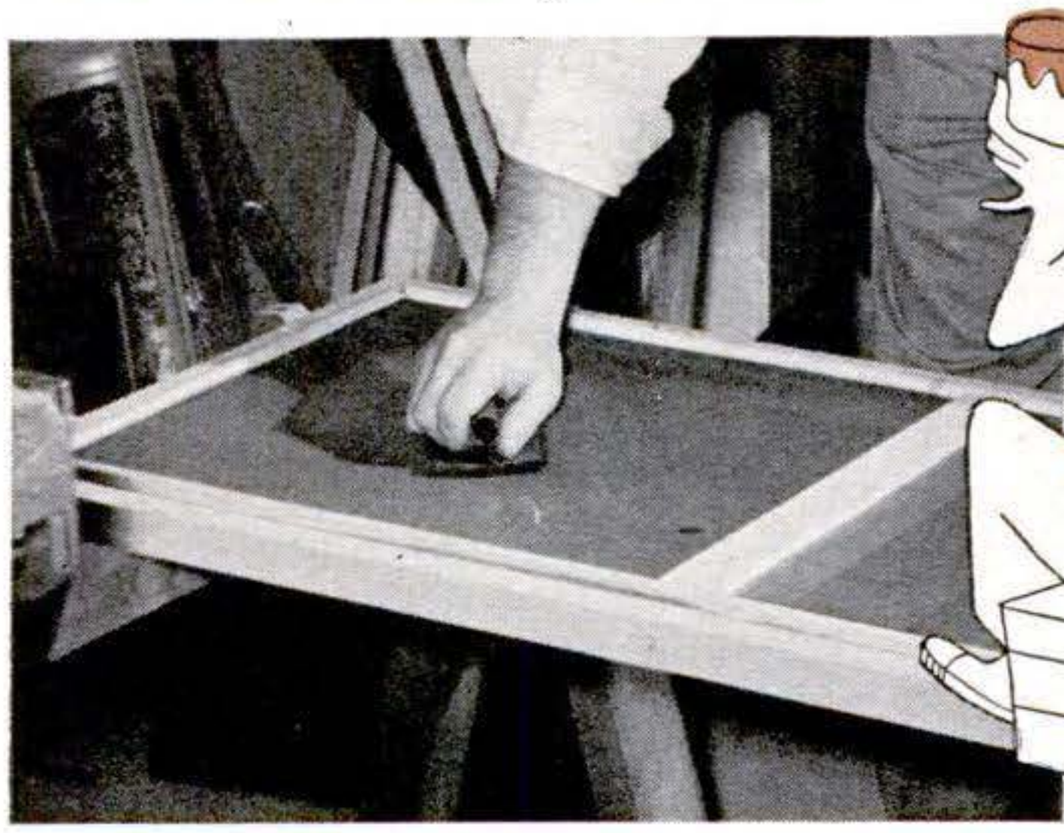
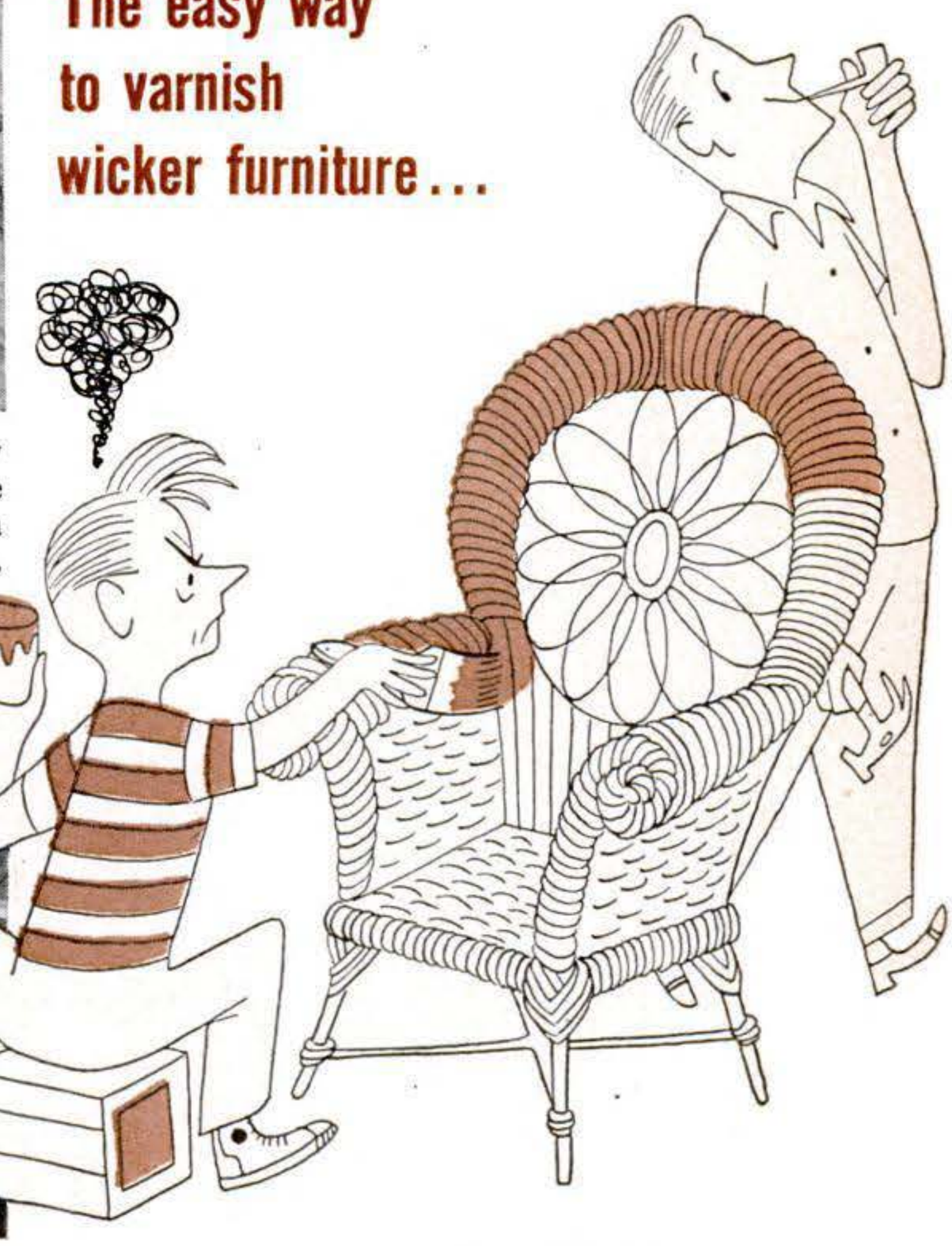
A NEW COAT OF PAINT on shutters and window trim may be all you need to tidy up on the outside. You can do the house itself later, a wall at a time, and the job won't seem so big.



CLEAN SCREENS mean no rust, which means no holes, which means no bugs, which means you won't have to turn off the Dodgers to dodge flies. Use a screen painter—carpet on a block.

The easy way to varnish wicker furniture...



...is with a boy of 10.

them. This same labor-saving arrangement can be used in applying spar varnish to rattan and wicker stuff and paste wax on aluminum furniture.

Now, as for those summer screens, there *are* short cuts there, too. The easiest way of dusting off the wire is to lay the screens flat across two horses and rub them with a screen painter. This is a wood block or metal plate with a piece of carpet fastened to the bottom.

Corners of the screens that are loose can be fixed with metal corner braces. Screens with more than two weak corners should be thrown away. They're beyond repair.

If the wire mesh is badly corroded or torn, replace it with plastic or metal that doesn't have to be painted. If you must paint screening, use a spray bomb.

If rust from old wire is staining the wood frame, lay the screen flat, remove the moldings and give the screen two coats of spar varnish or a special screen enamel. Then replace the moldings, countersinking your nails, and fill the holes with putty.

Remember that if you use a special sash paint on the wood, it leaves a hard, enamel-like finish that will last for four or five years. Remember, too, that it's a perfectly acceptable practice to paint the outsides of your frames this year and the insides next year.

Beat the Heat and Bugs

Ever fight gnats while you were painting your house? I've whipped that one. I beat them by a couple of months. Do your painting in the shade, too. Watch the way the sun travels around the house and plan your painting during those hours when the part you tackle is shaded.

Don't try to work when the temperature is below 50°. The paint won't set properly. Nor should paint go on a hot surface.

Most house paints today are designed to start chalking off after a year. This is particularly true of white paints. A microscopic film of chalked paint is washed off each time it rains, carrying dirt with it. This cleansing action is sometimes retarded on areas not evenly exposed. Play a hose

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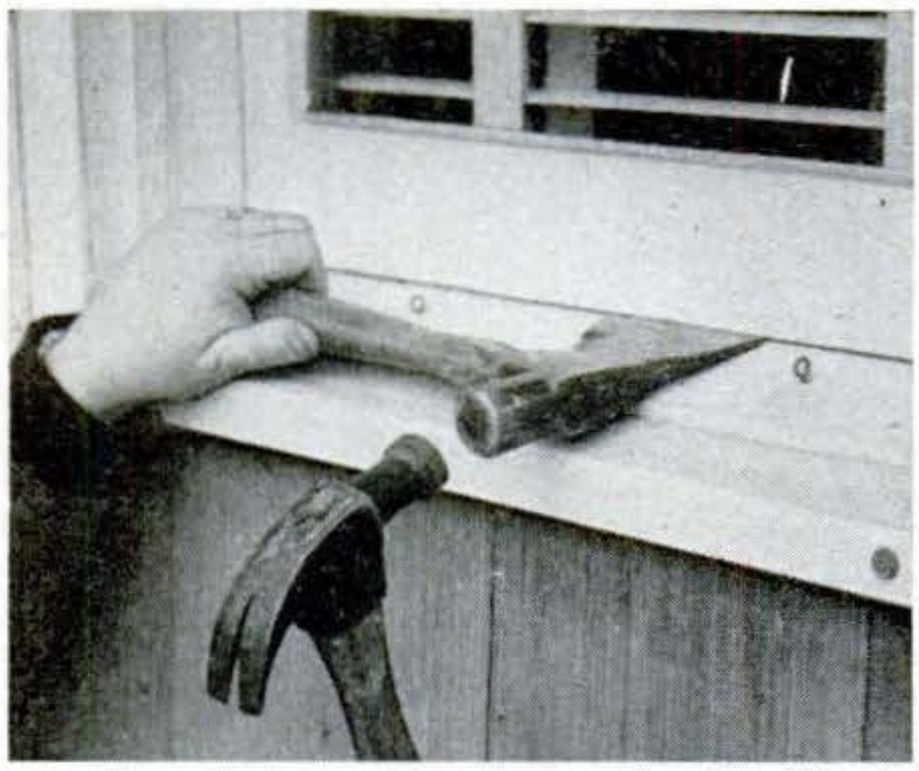
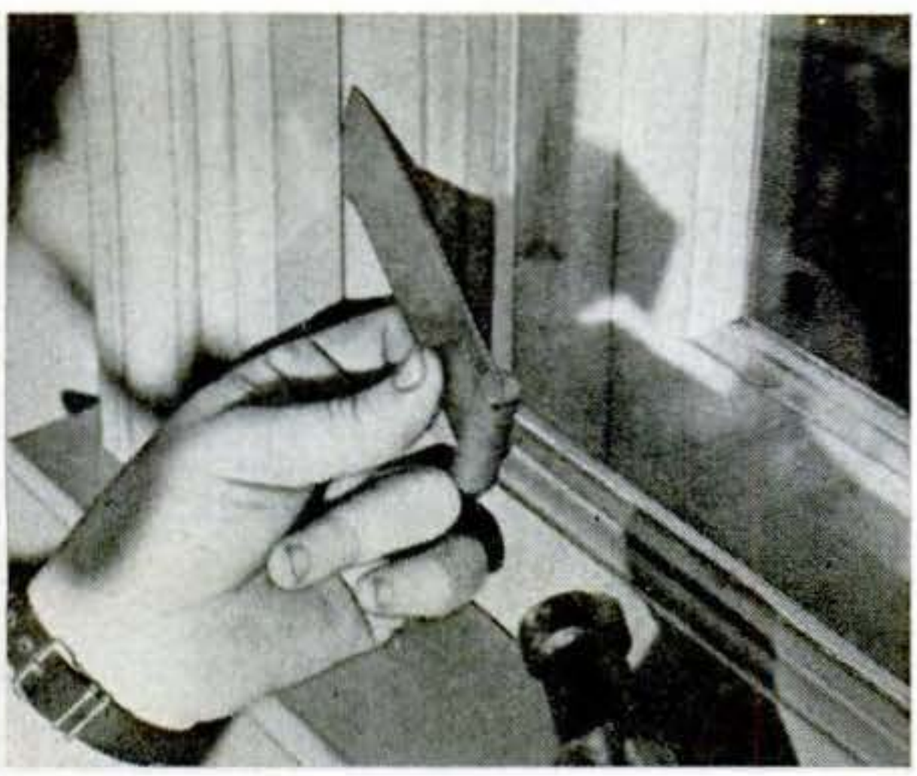
Three Ways You Can Free Tight or Jammed Windows



DRIVE AX HEAD into crack between bottom of window and window sill from outside of house. Tap gently and move tool along window to avoid marring it.

IF WINDOW BINDS, tap wood block against molding strip to shift it slightly outward and widen track. Scrape off any excess paint that might stick sash.



SPECIAL PRY is tapped into crack between casing and sash, then moved back and forth or twisted to free window. Work tool all around sash if jam is bad.

on such areas. Use a long-handled brush with the hose for difficult spots.

Do your painting in sections, one side of the house at a time. Start with the most noticeable side and let the balance go until next season. If you paint your house by bits and pieces, the maintenance really works. The paint doesn't get thin everywhere at once.

You can do a lot for appearance just by touching up. The whole front of the house can be brightened with a little trim and trellis paint on the front door, garage door and maybe the downstairs shutters.

Take off the hardware and polish it with fine steel wool or on a buffing wheel. Give the hardware two coats of clear lacquer before replacing it.

Don't wait for the first scorcher to discover that half the windows in the house are stuck closed from lack of use. You'll be sweating inside while you're sweating out an afternoon's job of unsticking them. Make a window-by-window inspection now so that you'll be sure they'll open when you want them to. This is also a good time to check your sash cords and replace any that are worn or broken.

Sure Way to Miss a Game

If you time your attention to the heating system until the games start, you'll find that lubricating the oil-burner motor and blower takes just about nine innings.

If you have a circulating-hot-water system, don't forget that pump motor. If you have a separate hot-water heater, turn off the burner switch when you no longer need heat. Adjust the Aquastat to the summer setting. Change the air filters if you have a warm-air heating system. That will give you clean, cool air from your basement for the upstairs when the weather gets hot.

Oil your fans. Use No. 20 oil. You can get them dusted by setting them out on the kitchen table. Your wife won't go by them more than six or eight times before she begins making passes at them with a cloth.

Don't forget your exhaust fan. Make sure the belt hasn't rotted or stretched. Tighten the bolts.

Finally, there's the attic insulation. If you haven't insulated, you're losing heat in the winter and sacrificing a cooler house in the summer.

Next August you want to watch those Saturday afternoon games on TV in comfort, don't you? END

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Everybody's Building Kit Boats

From big, fast cruisers down to prams, you can get almost any boat you want in kit form.

"THE only place I had to build it," says Kenneth George of Joliet, Ill., shown at right lowering his 12′ Custom Craft skiff, "was in the spare room of my upstairs apartment."

George had foreseen that his finished boat would have to come down a ladder. In the case of another enthusiastic builder, who constructed his craft in the living room, a picture window had to be removed to allow launching. He, too, reported he saw beforehand that this would be necessary. But it stands as likely that at least *one* of the thousands of kit boats assembled by amateurs in recent years has been trapped in the basement, restricted to cruises between the furnace and the preserve closet.

The boom in kit boats is reflected by a record 3,250,000 outboard motors now churning U. S. waters, with more than 2,645,000 of these sold since the end of the war. Not that all prefab boats are outboards. You can buy a kit nowadays for anything from paddle-powered kayaks to sleek Diesel-driven express cruisers.

The bulk of kit sales are for kicker-driven craft less than 20′ long, though, and the bulk of the buyers are strictly amateurs, both as builders and boatsmen. If the idea of joining this crew tempts you, here's what it is like to build from a kit:

What do you save? The going price of a finished boat can be sliced roughly in half if you assemble it yourself. This assumes, of course, that you don't charge yourself for labor and that you don't incur such extra expenses as buying costly new tools or renting space in a neighbor's garage.

The saving often represents the difference between a boat or none. It is entirely possible for a deft (perhaps lucky) person to buy a kit, build and enjoy the boat for a season or two, and then sell it for more than the kit cost. But don't count on that.

How long does it take? Some little prams and dinghies, their manufacturers quite reasonably claim, can be built in an easy weekend. There are also big cruiser kits on which hull assembly alone can run well over 100 hours—with many, many more hours needed for engine installation, cabin, fittings and painting. Much depends on whether you're a slap-it-together builder,

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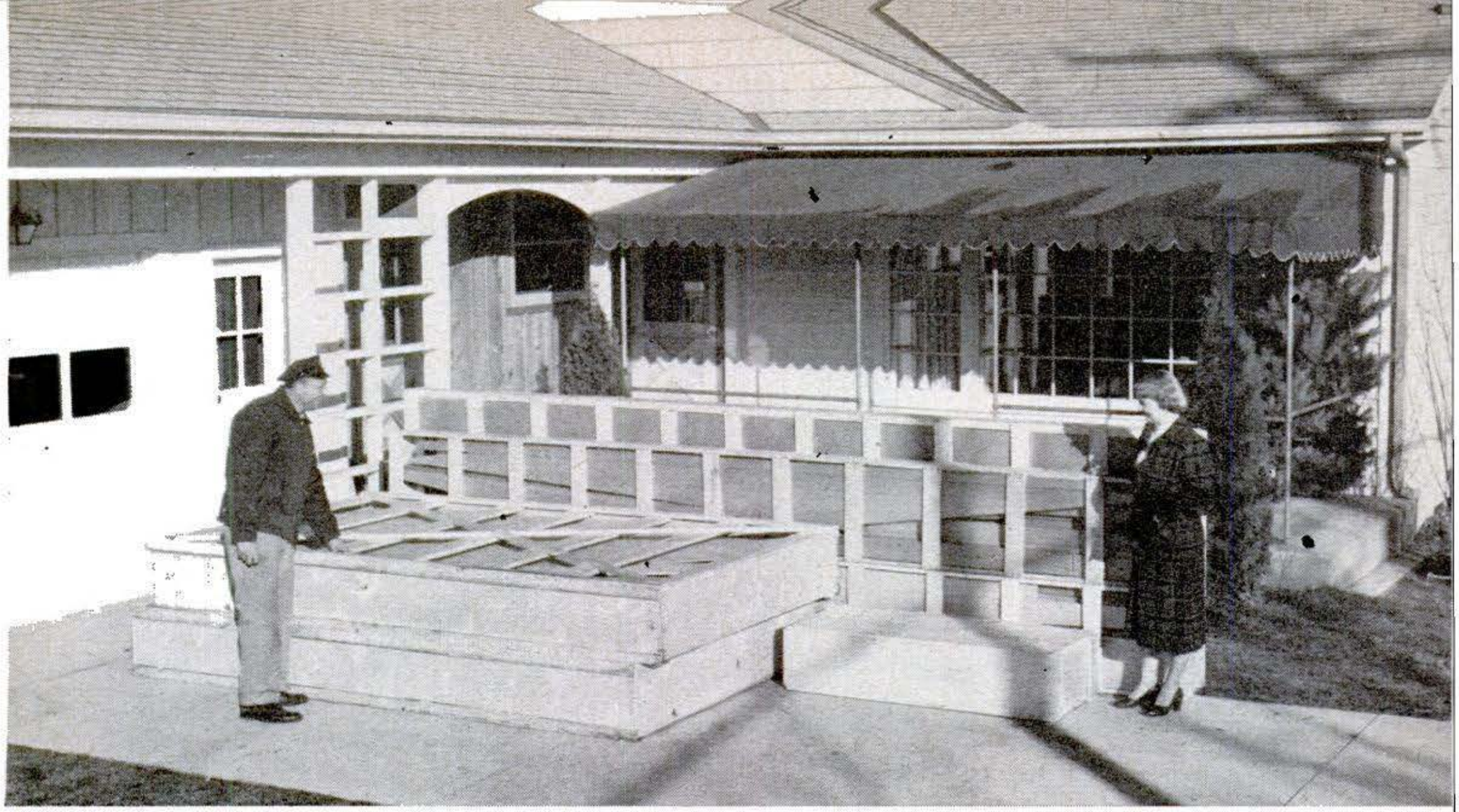


a loving-care craftsman or something between.

As a rough guide, however, it is probable that if you choose a 14′ or 16′ outboard boat, and put in fairly solid week ends and some evenings, you can have it afloat in about a month of spare time, possibly less.

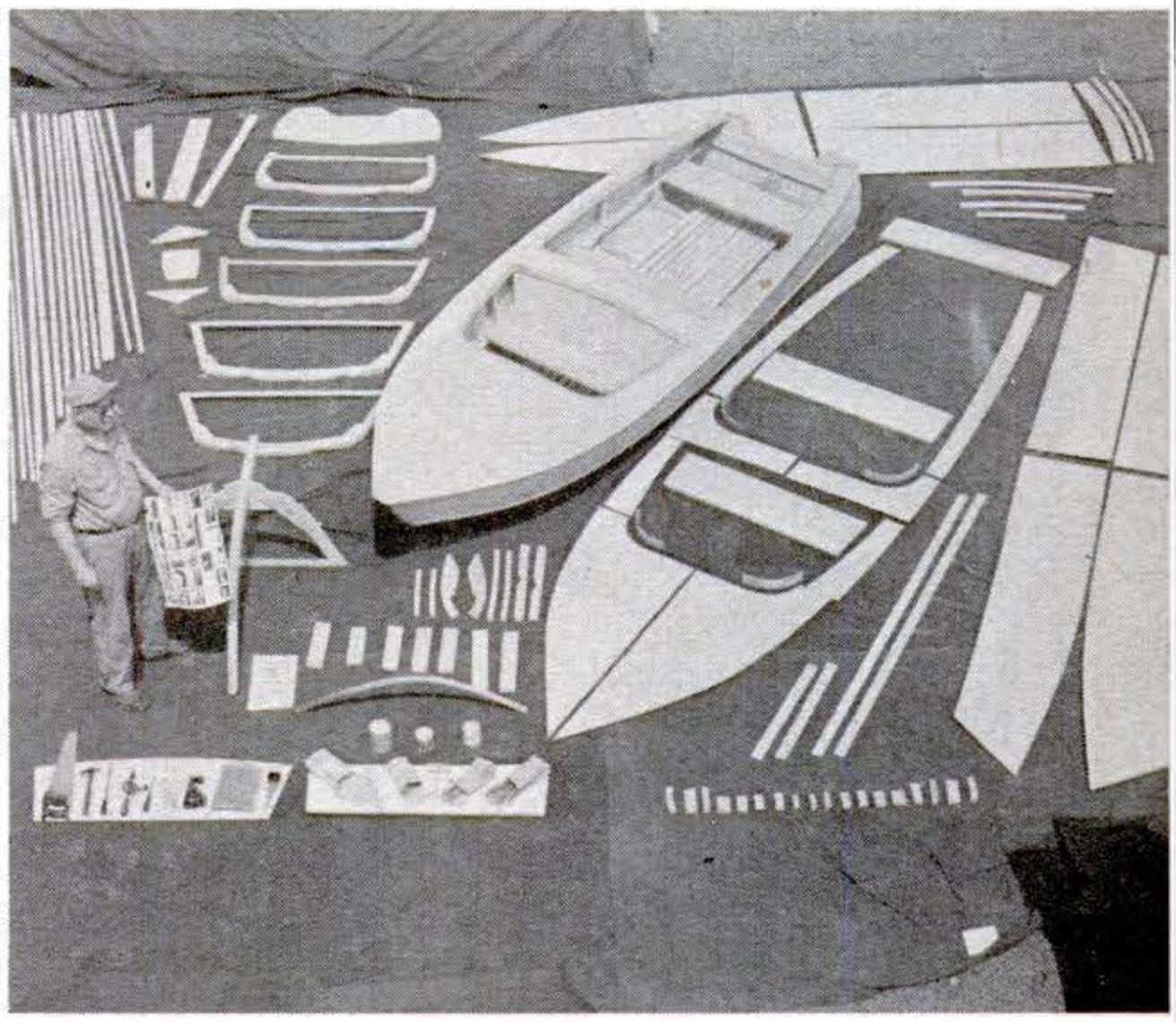
How hard is it? Kit boats have been successfully assembled by women, youngsters, and men who shy at building plain bookcases. The job has given a lot of convinced all-thumbs people new respect for their unrealized ability. Not that assembly can't be botched. It takes patience at doping out the manufacturer's intent, care at fitting and fastening so that the hull lines are fair, and the labor that goes into any important finishing and painting task. If you're uncertain about your woodworking, start with a simple, quickly assembled craft and save that cruiser until later.

In assessing your ability, ponder whether you want to buy a completely prefabricated kit or one in which the parts are just precut. The first costs a bit more but goes together faster and more surely for the novice. The precut kit comes with stem, frames and other tough parts done but with planking and some other sections in need of final trimming and beveling. While this saves you money, it's also more work.

What tools? For years the bandsaw has been the classic power tool for a boat builder—but no longer. With a kit, bandsawing has all been done at the factory. Kit manufacturers say that their products can be built with just ordinary home tools like a saw, hand drill and screwdriver.

Although this is true, there *are* some other tools—not uncommon ones, either—that are worth their weight in sweat. A good ¼″ electric drill with a combined drill bit and countersink is a big help. So is a spiral-drive screwdriver. You'll also be helped by screwdriver blades for your bit brace. An accurate level, a good try square, and sharp saws, planes and chisels will be invaluable. It is almost impossible to have too many C clamps. When finishing time comes, a husky portable power sander helps a lot.

What are the headaches? Most kit



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BIG KIT in driveway at far left contains knocked-down hull for 31′ Chris-Craft express cruiser. Hull kit costs around $1,500, weighs more than 1½ tons. Cabin, windshield and flooring come in a second kit, for about $500. Finished cruiser has 10′ beam amidships and a double-planked bottom. Single or twin inboards drive it.

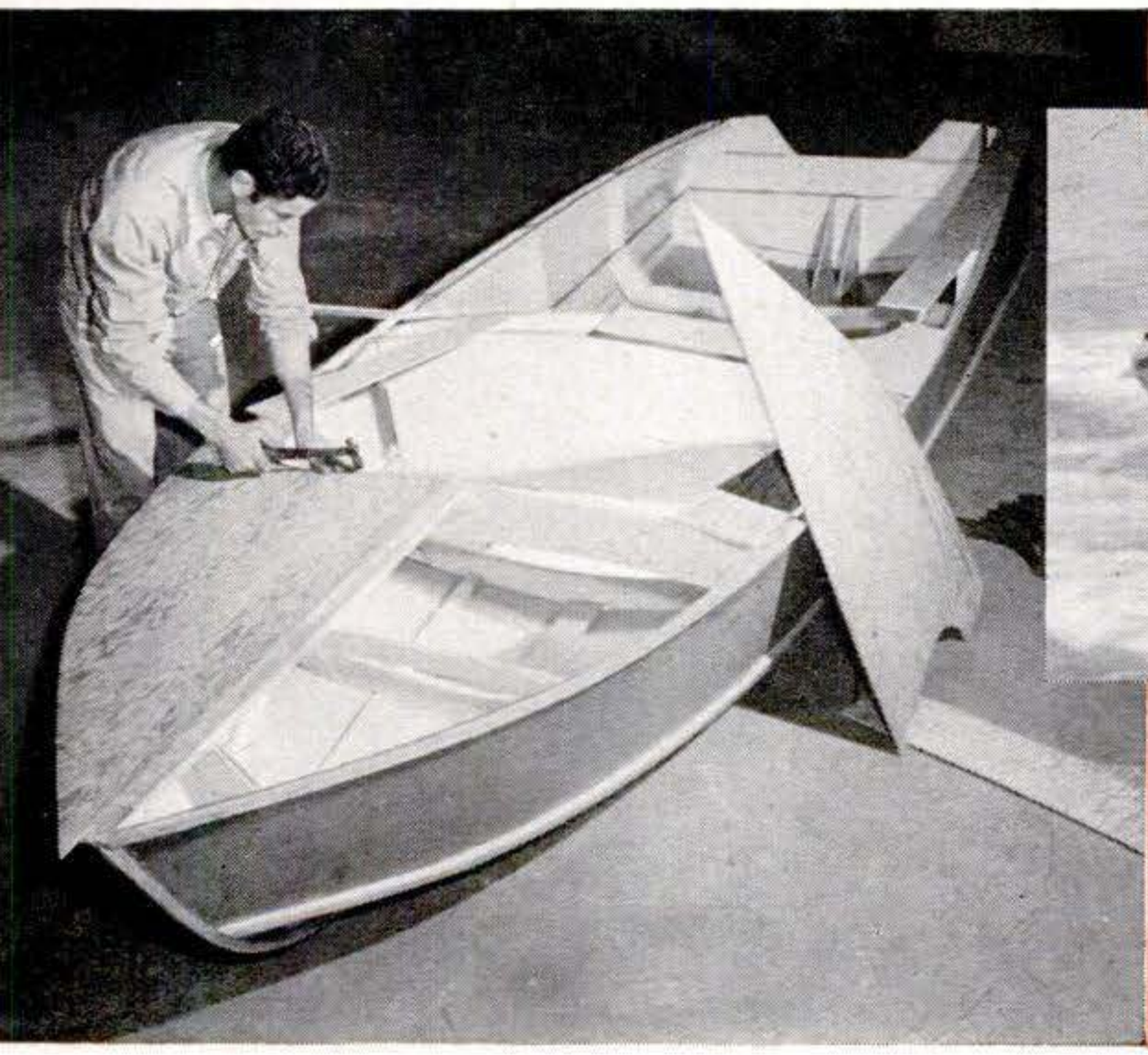
makers have taken elaborate pains to spare their customers from headaches or disappointment. Experience suggests, though, that beginners should watch out for these pitfalls:

• *Uneven building floor.* A boat will only be as fair and true as the surface on which it is built. If the floor isn't flat and level, it's worth making a special platform frame that is. Some kits are shipped in crates designed to be used as building frames.

• *Hasty cutting.* Often a part that doesn't quite seem to fit will tempt you to grab up a tool and whack it down to size. But if you are working from a good kit, be hesitant about assuming the factory has blundered; the odds are that you've misinterpreted the plans or been thrown off by the deceptively curved lines of the hull.

• *Too-fast fastening.* When the hull takes shape, some beginners have an urge to slap on the planking and take to the waves. But careful fit-up of the waterproof-plywood panels makes a boat stronger, tighter and better-looking.

Where to build it? Even if a shop door is too small to let the finished boat out, it is sometimes smart to do much of the work there—perhaps even a partial assembly, short of permanent fastening—and then



RUNABOUT by U-Mak-It Products, New York City, is 13′3″ long with a 57″ beam. Center deck covers storage shelf. The hull will take motors up to 25 hp. One of this company's kits, plus a finished boat, is shown at far left. It costs about $150.

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RACING PRAM by Chris-Craft Corp. was assembled by 13-year-old Jim Pocklington (above) as part of a class program at Algonac, Mich., school. The 10′ kit is $85.

FLAT-BOTTOM ROWBOAT by Ozarka, Inc., of Woodstock, Ill., weighs 80 lb. and can be assembled in 15 hours. Boat is 9′6″ long with 44″ beam. The sides are 14″ high. Price: $55.

complete the job outside. If the boat is to be finished in the garage, this minimizes the time your car is displaced.

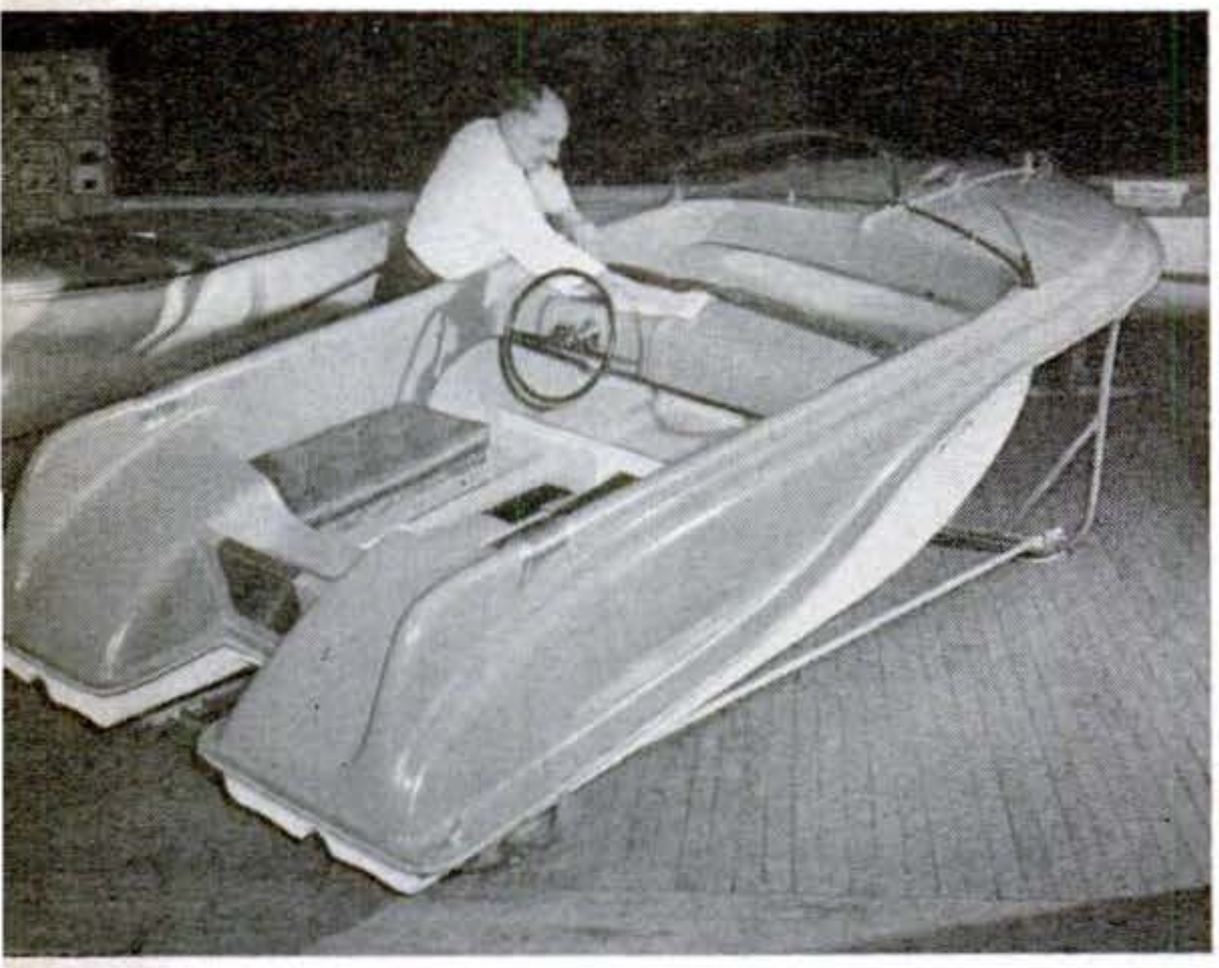
Many a kit boat has been built right in the back yard, covered by a tarp between sessions. Don't overlook the possibilities of a porch, either, though you'll almost certainly need a level building platform on the floor. If you build in the basement, remember that before the job is done, you will get utterly sick of home-cooked jokes about your chances of getting it out whole. END

Plastic Boat Needs No Paint

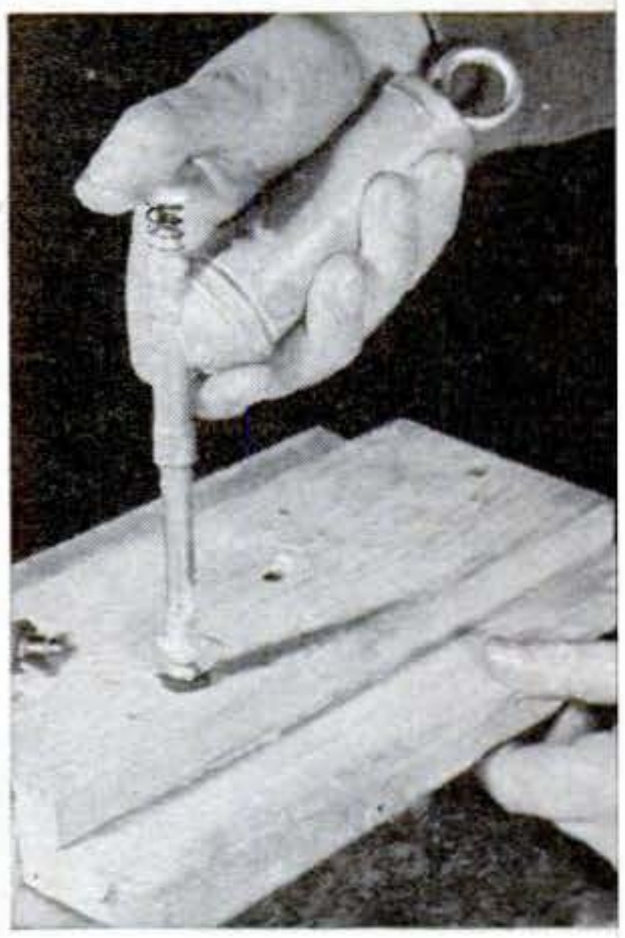
INTRODUCED at the New York Boat Show, the streamlined, molded-plastic outboard runabout below will be available soon.

The craft is molded of glass-fiber-reinforced plastic in two sections—hull and deck—which are then joined. Worms, barnacles or corrosive elements in fresh or salt water will not harm the boat. It never requires calking or painting and it will not rot. The colors—blue deck and white hull—are molded in the plastic.

Specifications include: length, 14′ 3″; beam, 60″; depth amidships, 23″; and weight, 350 lb. The boat seats five persons and can be used with motors of 7½ to 25 hp. *Winner Mfg. Co., Trenton, N.J.*



Calking Screw Stops Boat Leaks

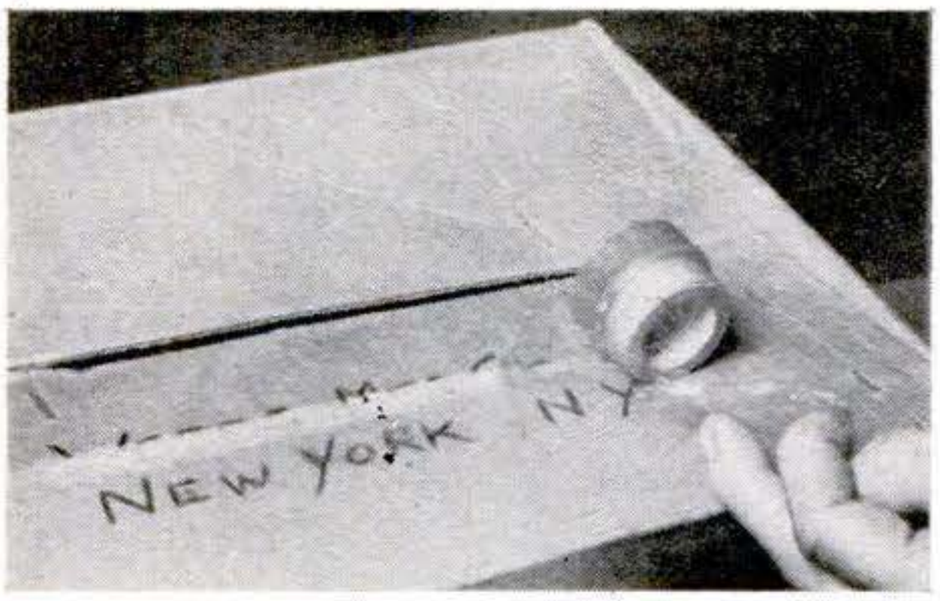


YOU don't have to haul a boat out of the water to stop most leaks if you use this hollow screw. The screw can be used at any place that two planks overlap. A pilot hole is drilled and then the screw is threaded in by hand. An ordinary grease gun is used to force light calking compound (right) through the hole in the screw and between the planks to seal the leak. Spots where it can be used include garboard planks, centerboard trunks and batten seams. *K & S Engineering & Sales Co., 33 Maiden Lane, Little Ferry, N.J.*

Canned Fuel Heats Boat Cabin

A LITTLE heater (6″ by 10¼″ by 14¼″ high) uses canned heat as fuel and is said to warm up an average boat cabin in 10 to 15 minutes. It also can be used in tents. The finish is rustproof vitreous enamel. *Sterno Corp., 9 E. 37th St., NYC.*

DO IT THE EASY WAY...WITH TAPE

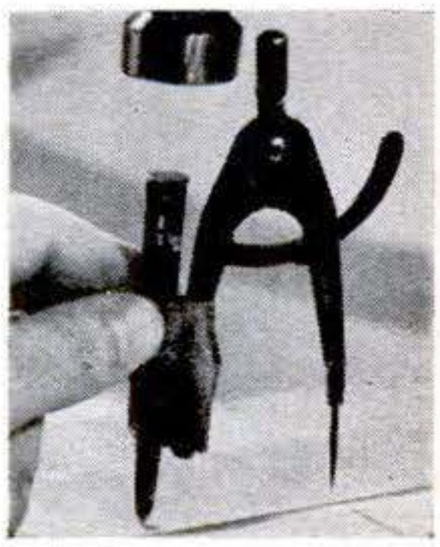


To remove addresses so cartons can be reshipped, cover with cellulose tape, then strip off. The marking will come, too.

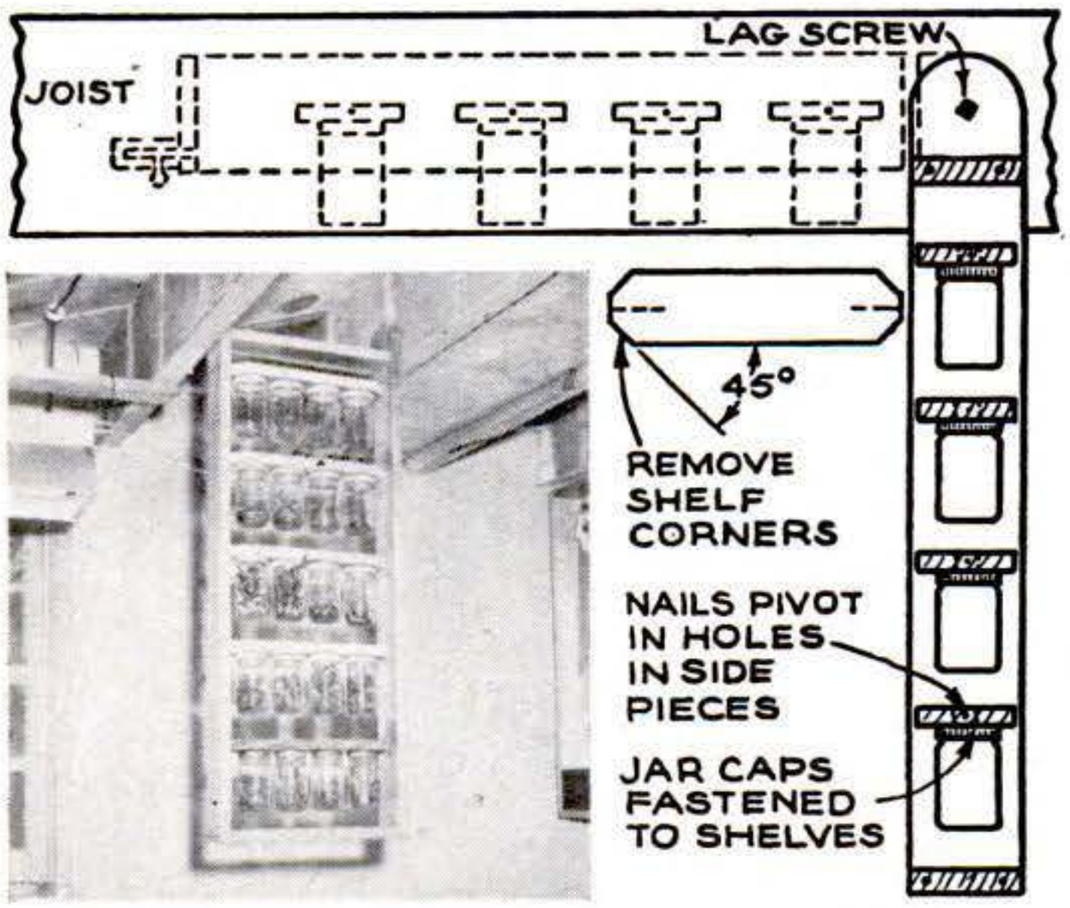
To prevent leakage when traveling, seal lids on jars, caps on bottles with plastic electrical tape. Seal poison at home.

To strengthen chalk against breakage, wrap it with masking tape. Start the spiral at the thick end of the stick so that it can be unwound and torn off as the chalk is worn down.

To mark work for drilling equidistant holes, bind the punch to a compass with friction tape. Lift compass before tapping punch to keep the separation adjustment constant.

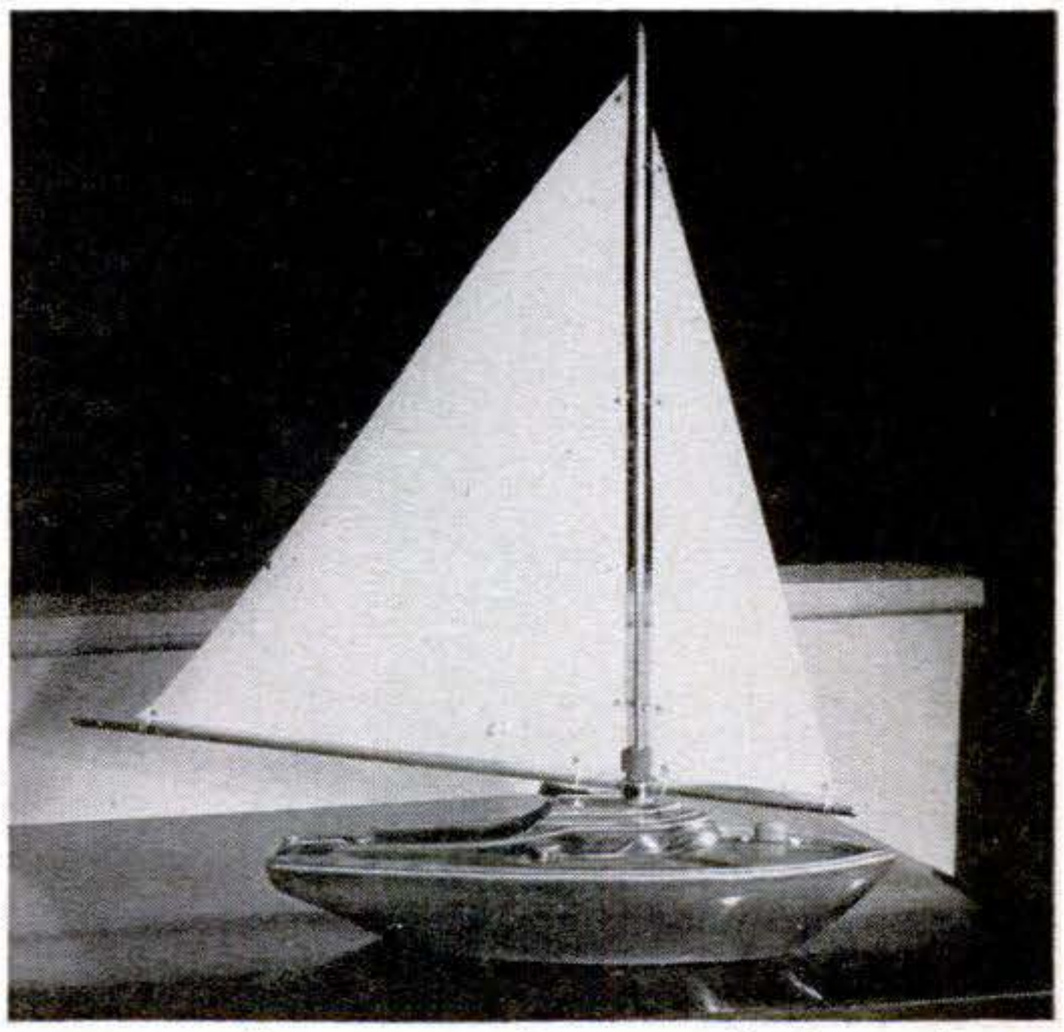


Rack Nests Between Joists



When not in use, this small parts rack can be swung up out of the way between two joists. The shelves pivot on nails, letting the jars hang bottom down when the rack is in its stored position. Lag screws serve as pivots for the top of the side pieces with washers between the joists and side pieces. Use lumber to suit your requirements. I built this rack of 1″ by 3″ stock. A barrel bolt or a screen door hook will hold the rack in the up position.—*John G. Voelker, Towson, Md.*

Sailboat Mast Catches TV Waves



The only waves the trim little sailboat model above rides on are the television kind. It's an indoor antenna. The main boom swings to any direction to bring in the clearest picture, and a knob on the forward deck controls a tuning capacitor that matches antenna impedance to the set. The boat has plastic sails and a ceramic hull. Earle A. Kraft, 619 Round Oak Rd., Baltimore, sells it for $12.95.

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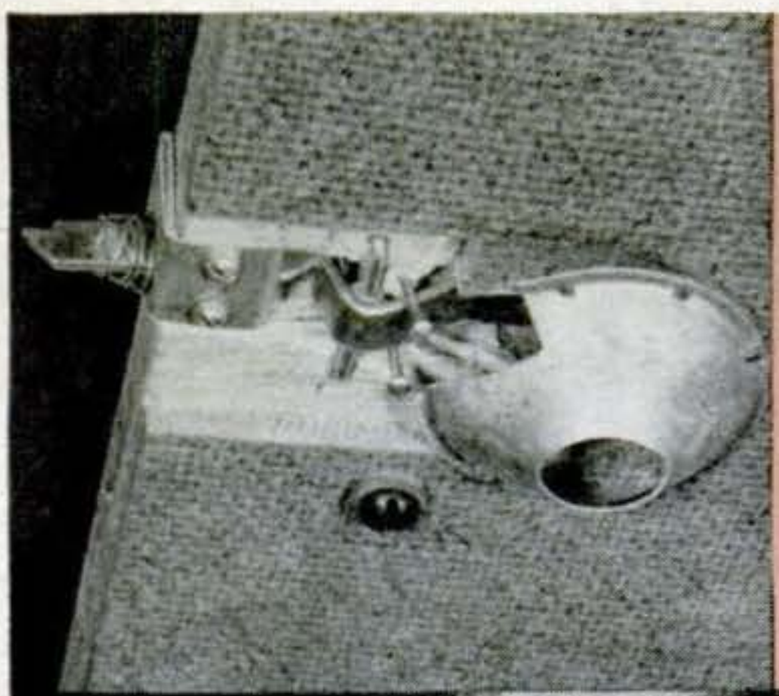
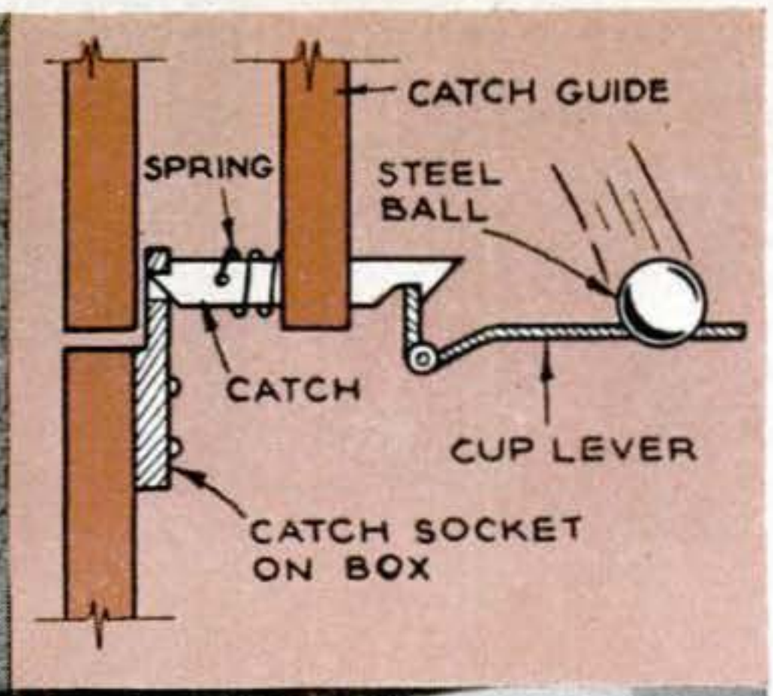
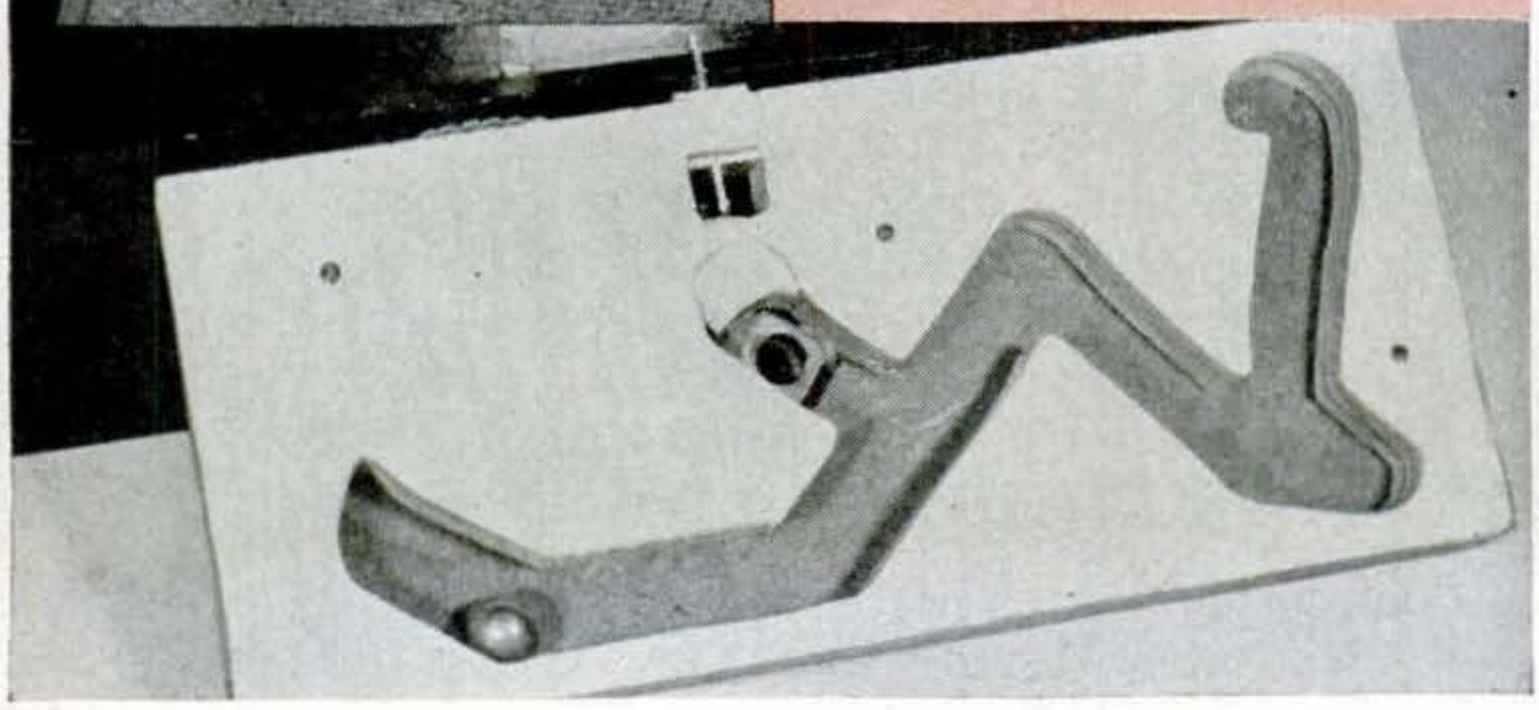
Wizard's Boxes







Pinball puzzler. The loud rattling noise which this wizard's box makes when it is shaken invariably leads unfortunate experimenters to jounce it around like a tambourine, convinced that something is bound to let go. An irregular track for a steel ball or marble is provided under the box lid, with a single channel leading to a small cup. When this cup is depressed, it withdraws the lid bolt, freeing the top of the box. Until you know the trick, no amount of work will jockey the ball into the right groove and the cup. Make the track for the ball of ¾" plywood, backed by smooth-surfaced wallboard. A flashlight reflector will make an excellent shield for the depressed cup.

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Secret locks, based on principles of physics, engineering, chemistry and metallurgy, will puzzle your friends until you show them the simple tricks that release the lids.

You Can Build

By Prof. A. M. Low

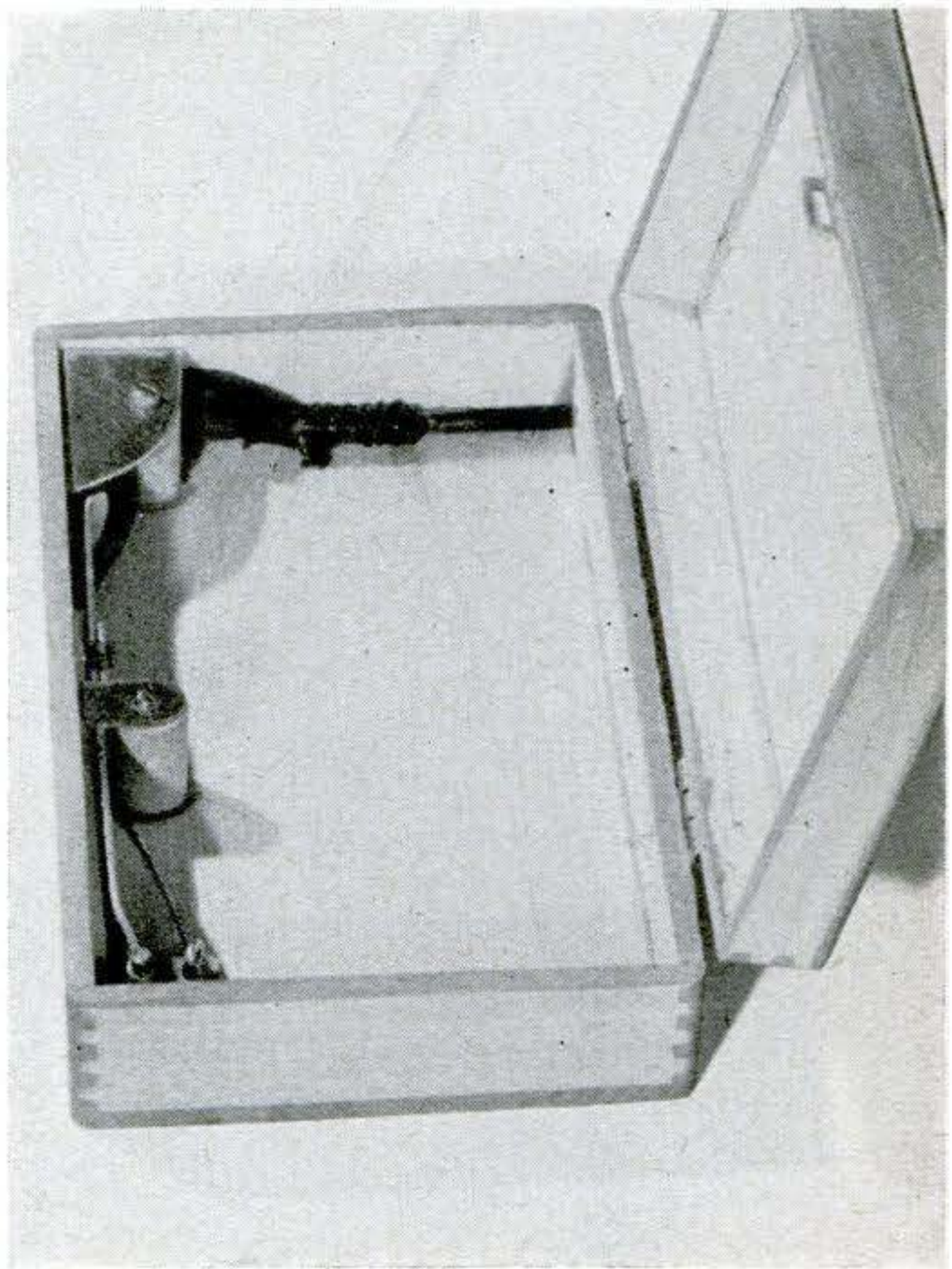
BOXES which cannot be opened without a knowledge of their unseen locking mechanisms probably originated in China many centuries ago. The ancient Egyptians may have used them. And the Borgias refined the design to reward the successful puzzle fan with a lethal shot in the thumb.

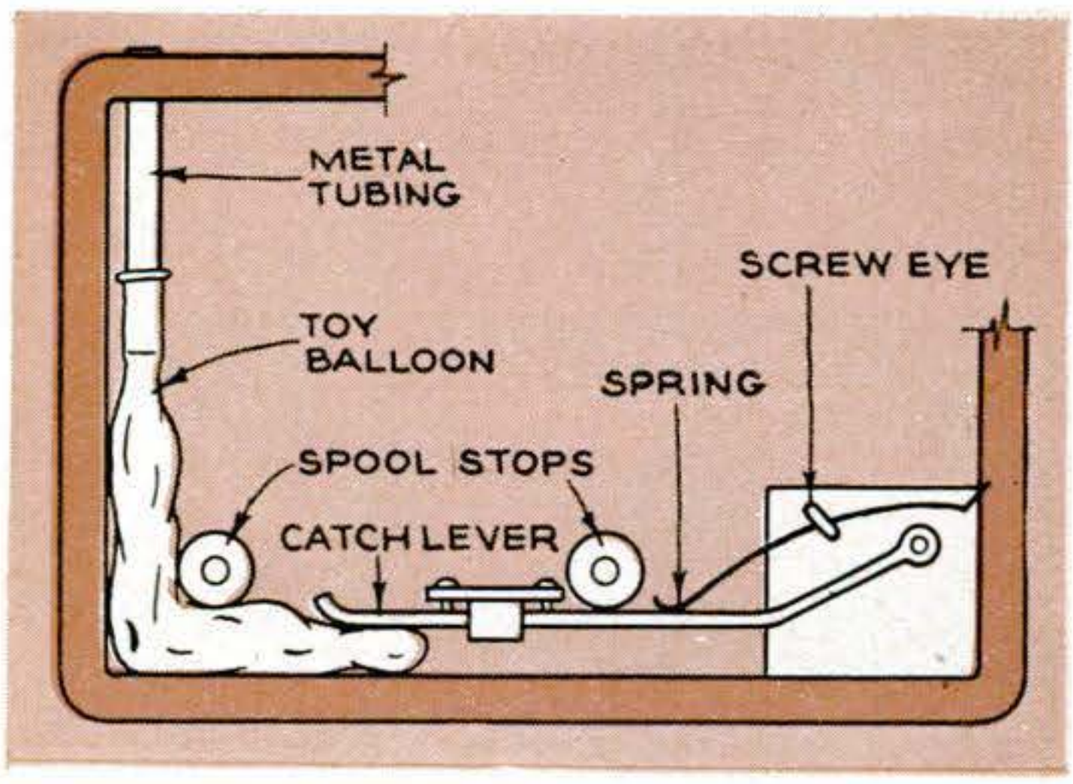
Today, spring-loaded daggers are out, but the trick box is still a parlor menace. Your friends can probe and rattle the eight little wizard's boxes pictured here for hours on end without discovering the simple devices which release their lids.

Unlike most Chinese boxes, which are made with one particular part of a pattern that must be pressed or slid into place before the lid can be raised, these boxes depend upon a mixture of physics, engineering, chemistry and metallurgy for their operation. Patience and a good memory will not open them; the solution calls for the kind of intellectual exercise which makes a puzzle really novel.

There are innumerable variations of the designs I have outlined. During the last war those who were engaged in the manufacture of booby traps learned how many trick devices can be used. One of the simplest of all bomb boxes was detonated when a globule of mercury closed a circuit as the box was lifted or tipped in some particular direction. A wizard's box could be opened by using a similar globule of mercury to feed current to a solenoid or magnet. Here, of course, the contact wires would have to be carefully placed, to avoid accidental releasing of the lid. Or a penny might be used to close a circuit from a battery inside the box to a magnet, simply by threading two lead wires through a side wall. You can even make a box that opens only for a certain musical note by basing the lock on a reed which responds to that note.

Try your hand at one of these wizard's boxes; they will pay off, both as craft projects and as entertaining puzzles.





Pneumatic release opens this brain teaser, which calls for a few pieces of brass stock, a weak strip of spring steel, a small metal tube and a toy balloon. By breathing through a minute hole in one corner of the box, you inflate the balloon, causing a spring-backed lever to withdraw a catch from a latch plate attached to the lid of the box. Spring adjusts by turning the screw eye, must be just strong enough to deflate balloon.

Please turn the page for more wizard's boxes.

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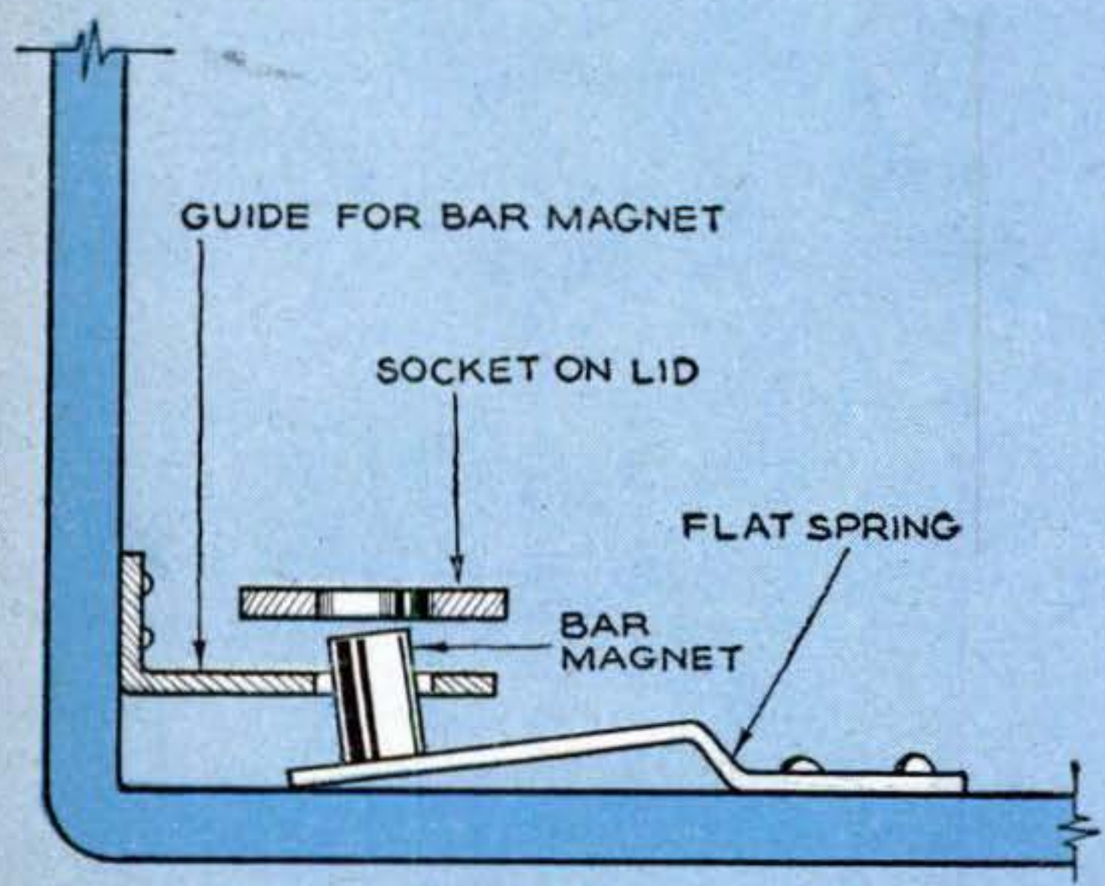
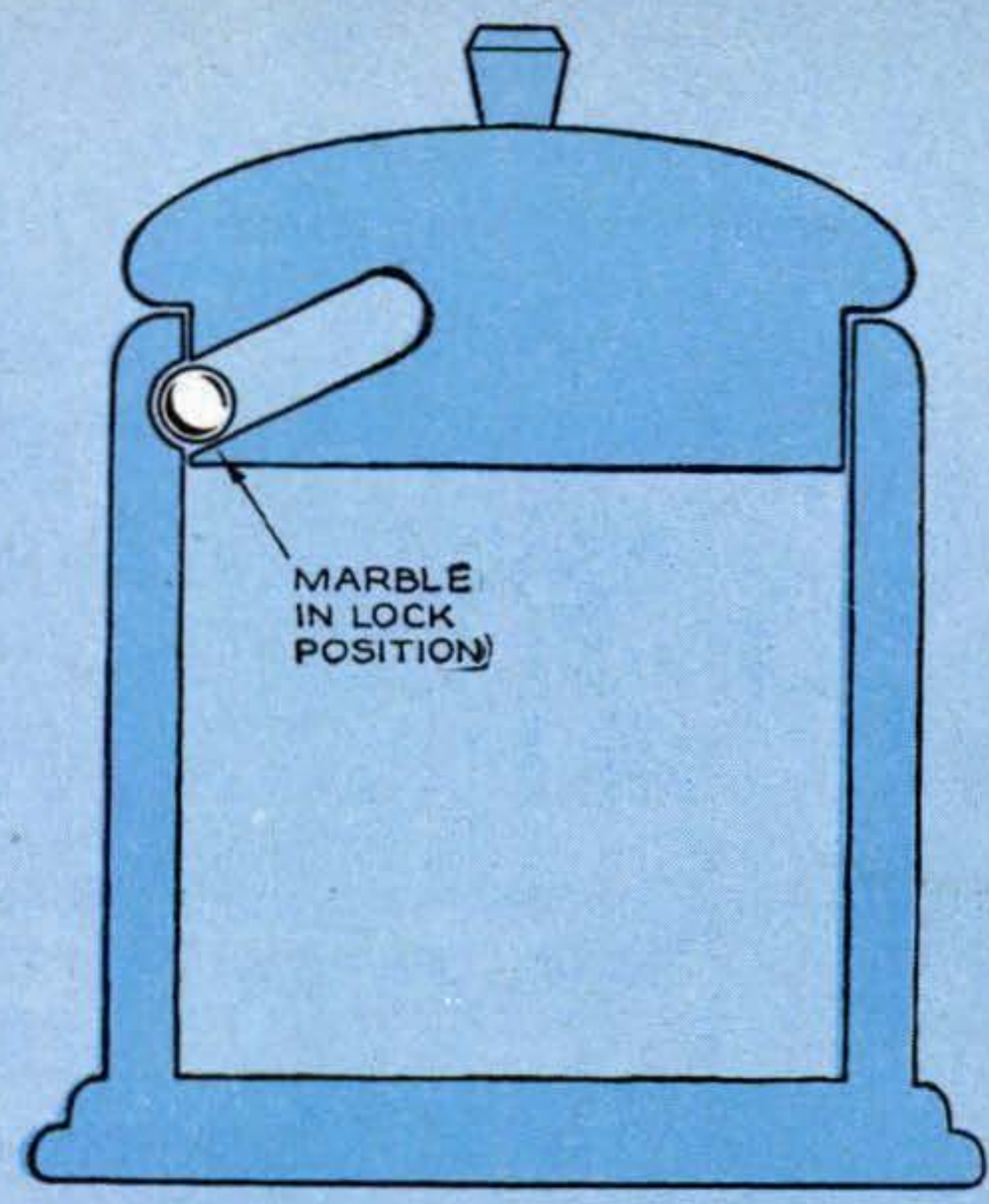
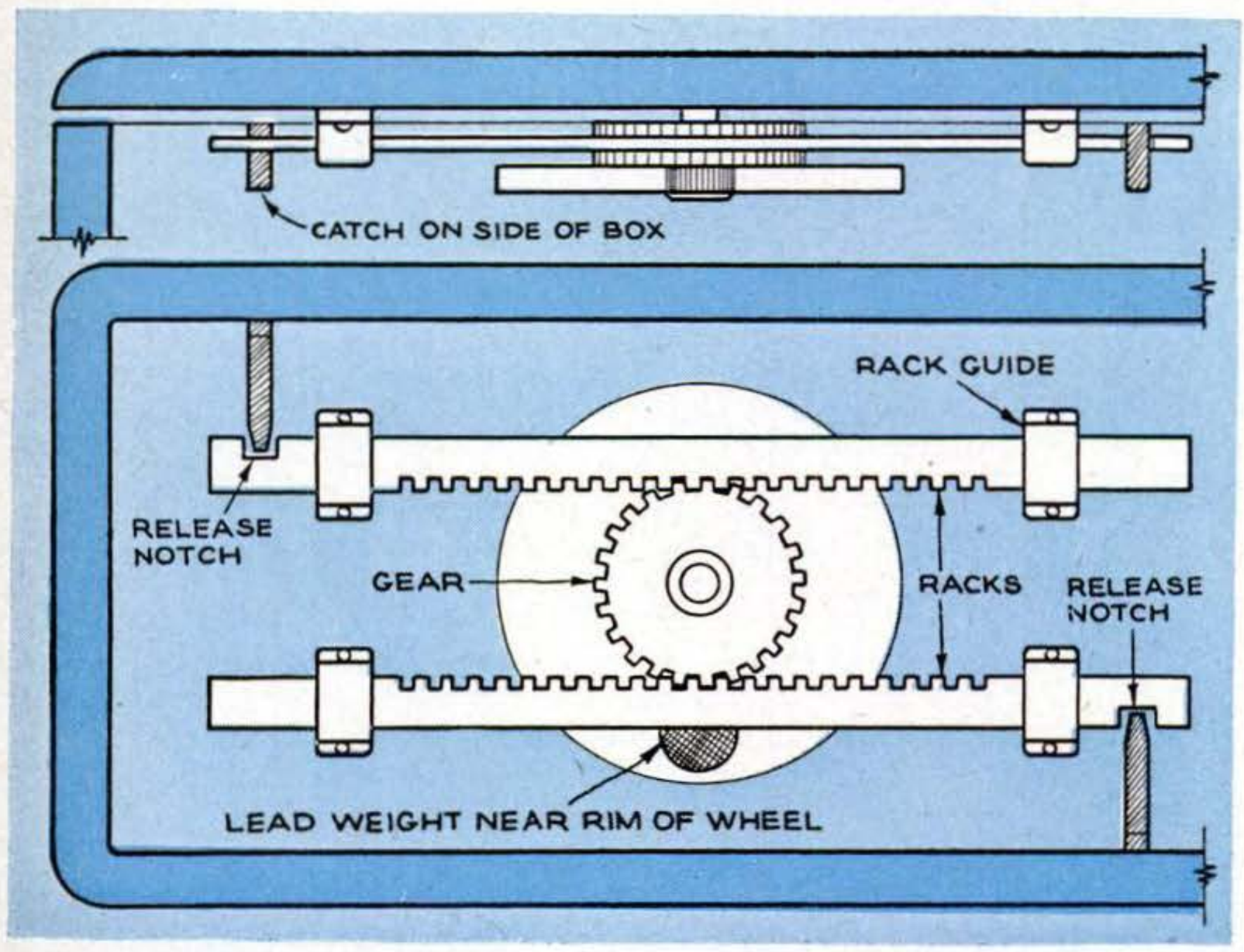
Magnets, marbles, and metal that melts at 70° keep the lids on these four boxes. Weighted wheels lock the other two.



Key without a keyhole opens this magnetic baffler. A small bar magnet forms the catch. It is attached to a thin strip of spring brass that normally presses it through a nonmagnetic guide and into a nonmagnetic socket attached to the lid of the box. In this position it is close enough to the side of the chest to draw back from the brass socket when a small piece of iron is placed against the outside surface of the box. An old iron key is a good releasing agent; you have only to fit it to an imaginary keyhole and the lid comes free. A variation would be to use an iron bar as the catch, and a magnet for the key. Use a small but strong Alnico magnet in either case and brass or aluminum for the other parts.



Gravity locks this cylindrical container—a natural for the craftsman with a yen for lathe work. The body of the box is turned with a hemispherical groove near the top. The lid is a second turning, having a deep setback section which fits into the neck of the box. A hole is drilled at an upward angle into the side of the setback, and a marble inserted in this hole will drop part way into the hemispherical groove, locking the lid in place. For anyone familiar with the mechanism, it is a simple matter to tilt the box in the right direction, allowing the marble to roll into the lid where it no longer serves as a catch. Sand the marble channels well so that it will roll freely without catching at any point.



End-over-end motion does it. The mechanism on the lid consists of a small gear wheel, interacting with two racks. Near the end of each rack is a notch, and at a certain point in their travel these notches clear a pair of catches in the box. A small weight near the rim of a disk attached to the gear wheel causes the gear to rotate when the box is flipped over. To open the chest, it must be rotated until the racks reach one limit of their travel and then revolved a known number of times in the reverse direction. Rack teeth can be shaped with a jeweler's file to mesh with a clock gear.

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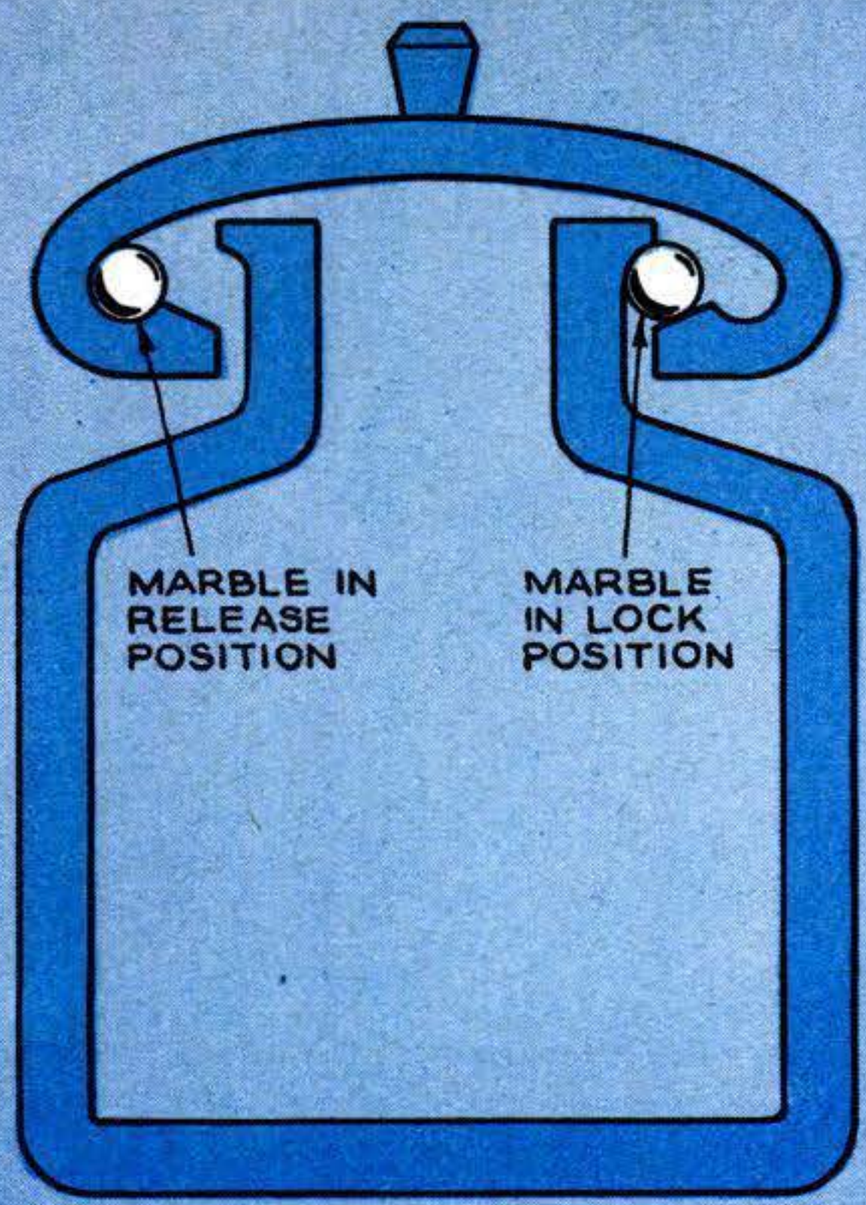
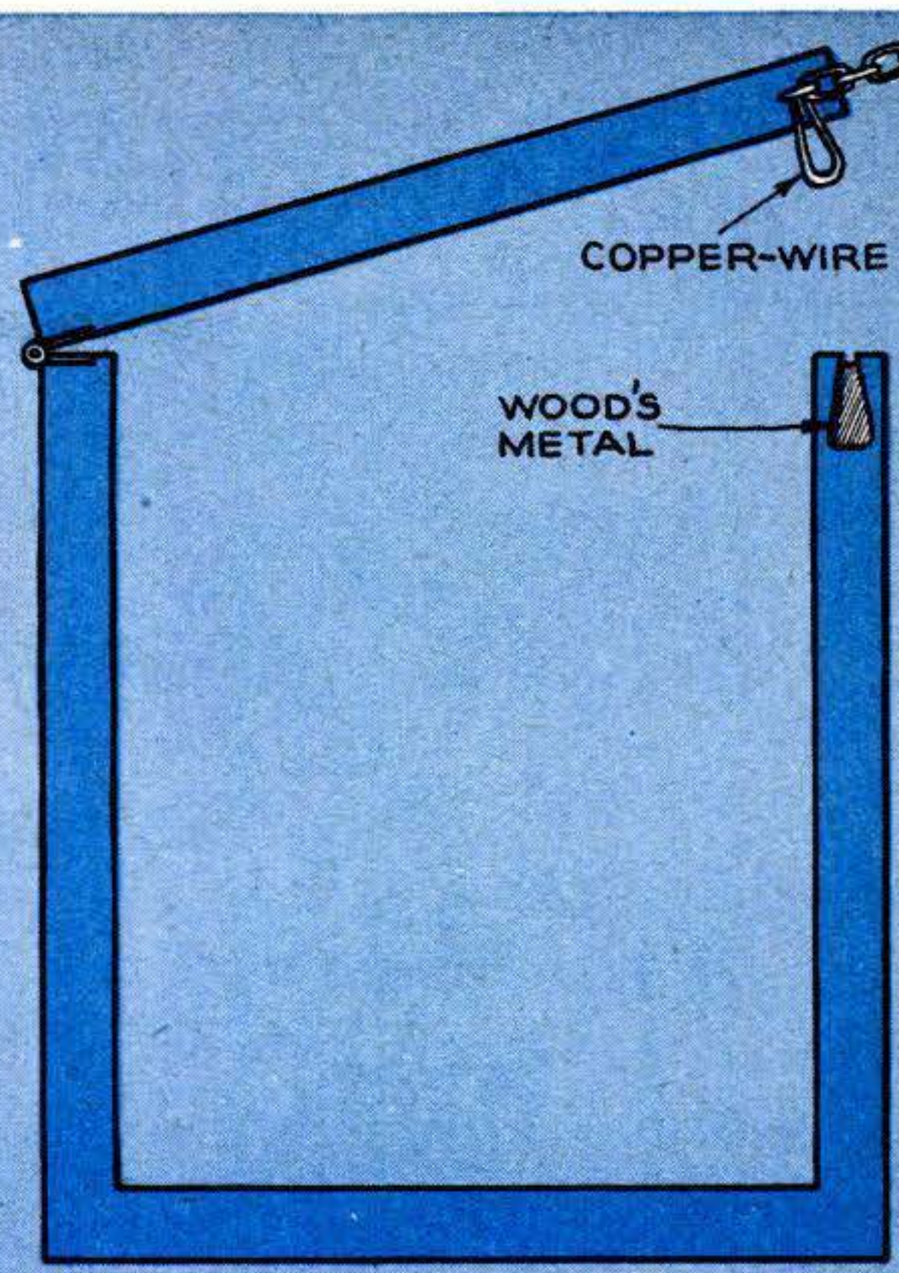
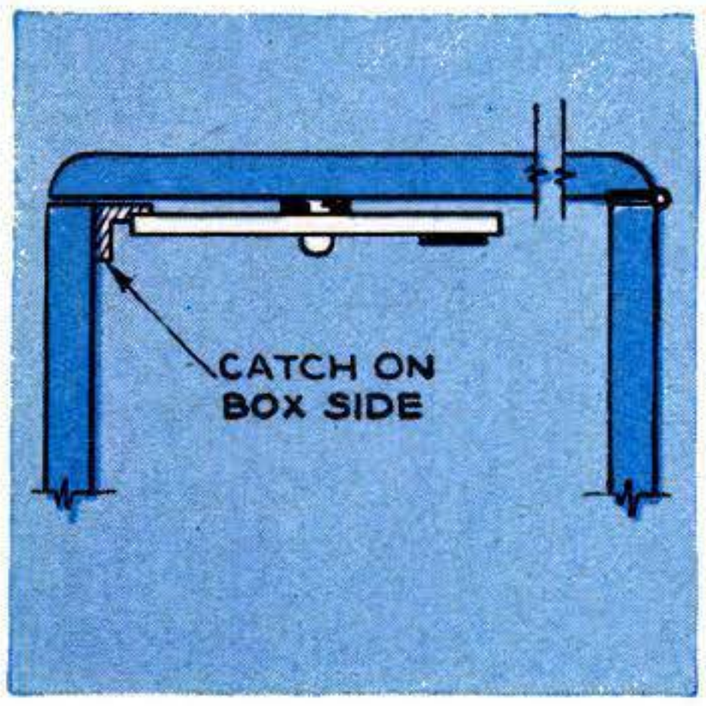
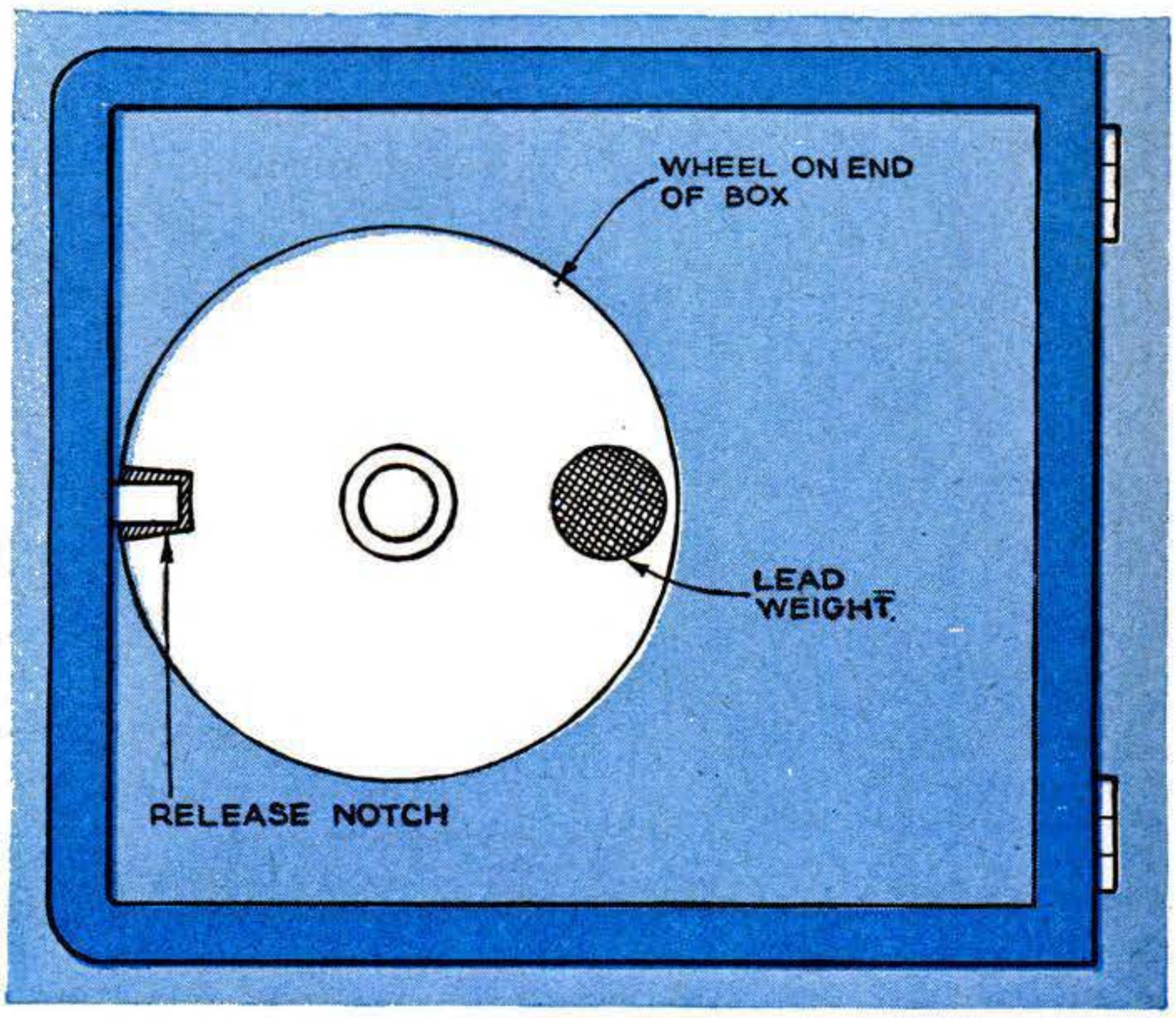




Centrifugal force releases the top of this canister which, like the gravity box, can be used to hold cigarettes or candy. An ideal project for the metal worker, it uses two or three marbles, placed in a groove in the lid, to hold that member in position. If the box is shaken, the marbles jog out of the groove and then roll down between the lip of the box and the sloping lid flange. A glance at the diagram shows how this locks the lid in place. A quick twirl of the box forces the marbles back up the flange and into the groove. Presto! You can now help yourself to another bon-bon. As with other boxes, be careful all parts are smooth and free-acting before you close it for the first trial.

Thermal tripper-upper. Few wizard's boxes are simpler to build and more difficult to open. The successful puzzle fan must place a lighted match or cigarette lighter to the two small extensions of twisted copper wire which project from a small hole in the lid of the box before the catch can be released. Actually, the wire extends in the form of a loop into a globule of low-melting-point metal poured in a small, undercut hole in the rim of the box. Wood's metal, which melts at about 70°, is an ideal locking alloy. Additional, blind wire extensions will add to the puzzle fan's confusion but are hardly needed. Heat is of course necessary when you wish to relock the box for another occasion.





Variation of the end-over-end box has a weighted wheel on the lid. A release notch at one point on the circumference of the wheel clears a catch on the side of the box. Obviously the lid cannot be lifted unless the box is tilted at exactly the right angle. Make sure the wheel runs true and free. END

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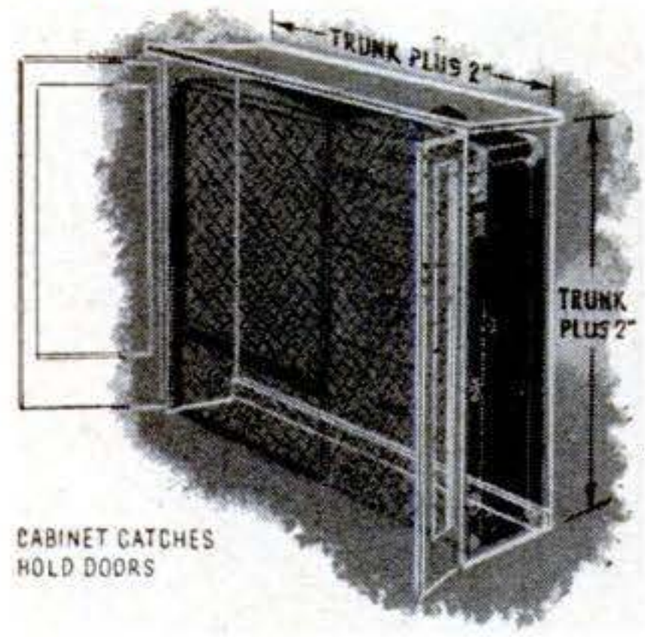
Storage Chest Hides Wardrobe Trunk

You can keep your trunk in the living room and use its space at the same time if you build a simple cabinet like this around it.

THAT hard-to-store wardrobe trunk can become a useful piece of furniture when it isn't traveling. Concealed behind a simple cabinet front like this, its drawers and compartments provide a working wardrobe for extra clothes and other storage.

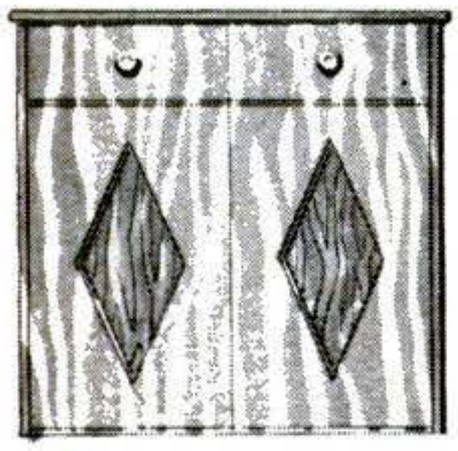
When you're ready for a trip, there's no lugging it down from the attic or up from the cellar, no dust and mildew to clean off. Just slip it out of the cabinet and you're set.

Frame. The cabinet is little more than two sides and a top with doors in the front. It has no back or bottom, just a narrow strip to tie the sides together at the rear.



DIMENSIONS are set to clear trunk easily. Make doors ¼" shorter than sides to clear floor—shorter for a thick carpet. Add ½" quarter-round molding under the top overhang and at bottom of sides for trim.

Make the top and sides of ¾" plywood or clear-pine shelving. Plywood is less likely to warp, but boards are handier since you can probably use standard widths and save sawing. Give the top about a 1" overhang all around—more in back if a baseboard and molding must be cleared.



SOLID DOORS are easiest to make. Ones at top are plain plywood with big brass pulls. Those at bottom have diamond-shaped cut outs backed by wood of contrasting grain. For neat job, use hidden cabinet hinges.

Fasten the top and sides together with wood cleats glued and screwed to the inside upper corners. This will keep screw heads from showing from the outside.

Choose your doors. These can be as plain or fancy as you like. The ones shown above are simple wood frames with metal screening tacked to the inside. The screening comes in several mesh sizes and in brass, bronze and the more common plaster-lath type that can be painted. It is available at hardware stores and lumberyards.

You can also make the doors solid if you like, using any one of several designs, such as the two shown here.

Finishing. For a really slick job, you can cover the top with one of the marbleized or wood-grain decal sheets and finish the rest natural. Or you can simply paint the entire cabinet to match surrounding furnishings.—*Walter F. Buehr, NYC.*

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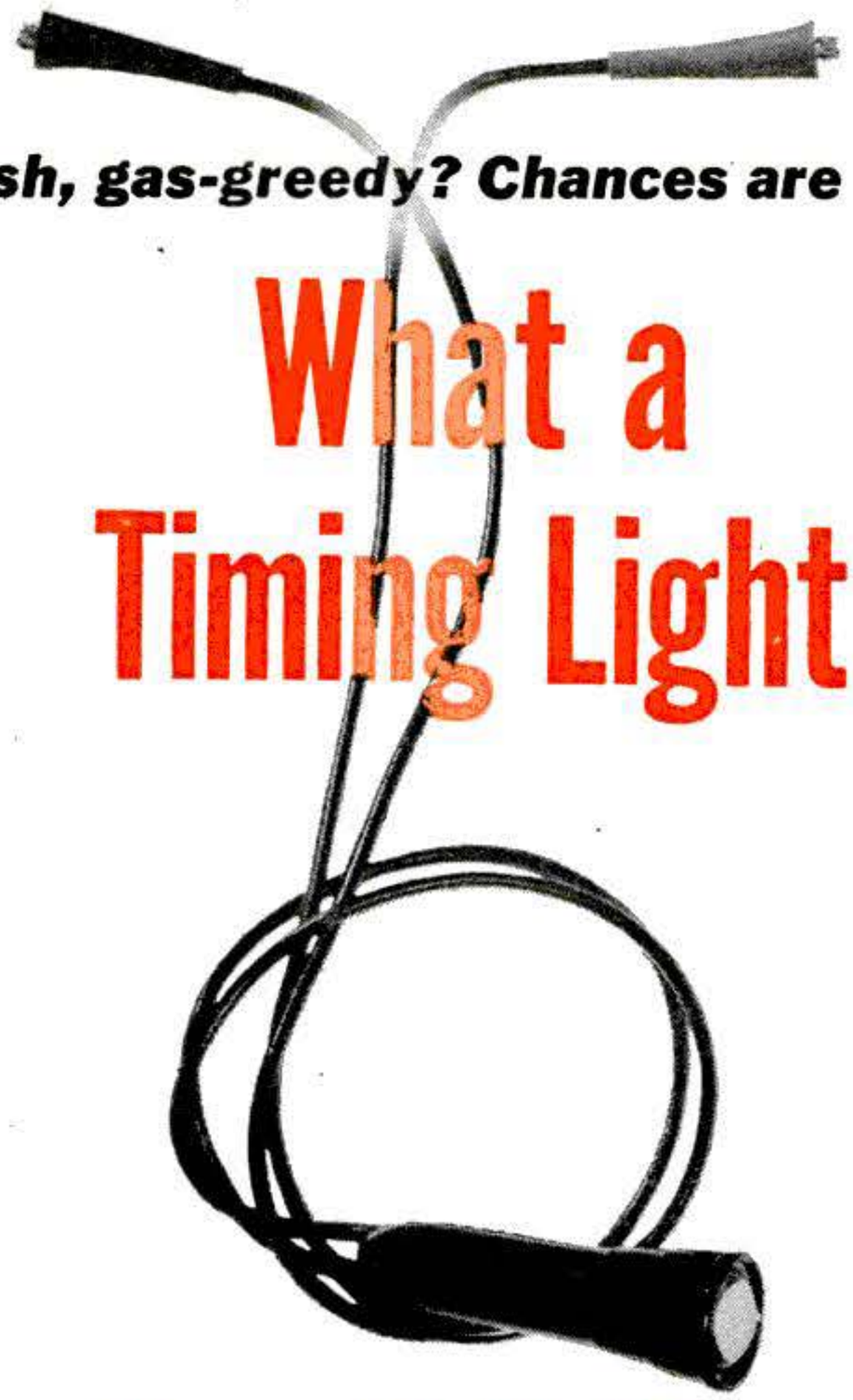
Engine sluggish, gas-greedy? Chances are the timing is off.

What a Timing Light Can Tell You



A NEON timing light can be a worthwhile addition to a car owner's tool kit. What will it do for you? Well—

If your engine lacks power, if it misses on acceleration, if it will not idle smoothly or if you're not getting all the mileage you did when the car was new, your engine probably needs timing. For best economy, it should be timed anyway every 2,000 miles, certainly after every 5,000 miles.

If the timing operation is to have any value, the distributor points must first be dressed with a flat file—or replaced if badly worn—then properly gapped. (A tune-up chart for your car will give this breaker gap, as well as the timing data you need.) The gap must be set when the rubbing block is on the highest point of a cam lobe. If it is not, the rubbing block will continue to rise as the distributor rotates and the final, actual gap will be more than the recommended value.

Turn the engine over—ignition off—until the rubbing block seems to be on the high point of a lobe. Insert a feeler gauge of the proper thickness between the points, and turn the adjusting screw until a very slight drag is felt on the gauge as it is moved back and forth. The lock screw has to be loosened before the adjusting screw can be turned, then tightened when the adjustment is finished.

How it works. Basically, a timing light consists of a neon flash tube designed to operate at the high voltage of the secondary-coil circuit. A neon tube is used because it has no time lag in flashing on or off. Since this timing light is connected to one of the spark plugs, it will flash each time that plug fires. If the light is directed at the timing marks, a stroboscopic effect will be created. Because of the human eye's persistence of vision, the rotating engine part will appear to stand still. Then, by properly correlating the rotating timing mark—*seemingly* standing still in one spot—to a physically stationary part of the engine, you can get the spark plug to fire at the correct piston position.

Marks. You may find timing marks engraved on the crankshaft pulley or vibration damper at the front of the engine or on the flywheel at the rear, depending on the make of your car. (See the data card at the end of this story.) Usually timing marks consist of lines indicating degrees before and after top dead center (tdc). A heavier line or a zero line indicates tdc. A pointer, which serves as a reference, is found on a stationary part of the engine, such as the gear-case cover.

But, if you own a Ford more than five years old, be sure you don't make the mistake of the back-yard mechanic who discovered too late that no light could be used to time the ignition of his particular car, a 1941 Ford. Until the big model changes of five years ago, Ford-made cars did not have the marks on which the stroboscopic effect of a timing light depends—one mark on a revolving part of the engine and another (perhaps a pointer) on a stationary housing or plate. Earlier Fords are timed by using a special fixture or a pair of metal rulers to position the distributor on its shaft.

Timing your engine. First be sure the engine is warm. If the timing marks are on the damper or pulley, you may have to remove the fan belt to use the timing light.

Disconnect the ignition lead going to the No. 1 spark plug, the one closest to the radiator. In a V-8 engine, the No. 1 plug is usually forward on the driver's side. However, if the timing marks do not show when the timing light is connected to this plug, try the opposite one. Connect one lead of the timing light to the ignition wire, the other lead to the spark plug. Be sure

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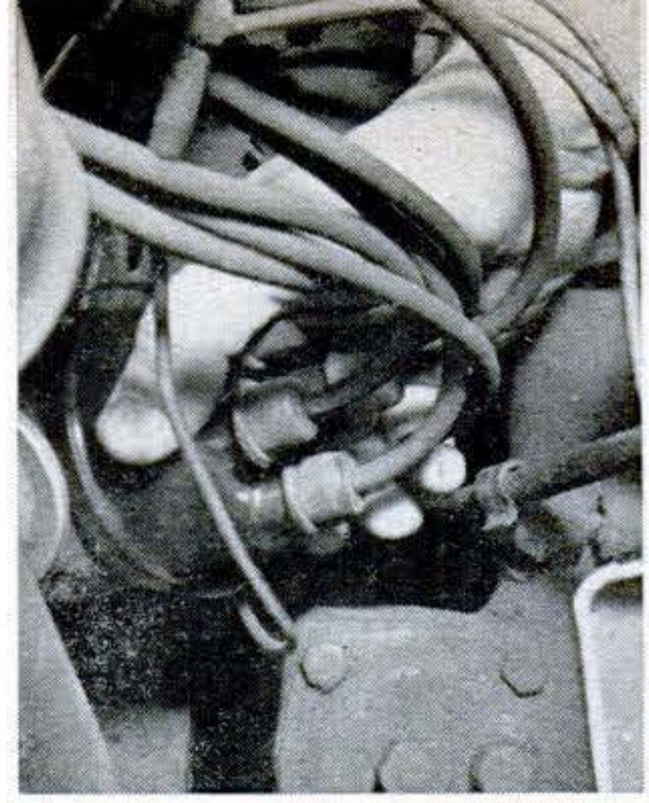
TIMING MARKS are engraved on a rotating part of engine—vibration damper, crankshaft pulley or flywheel. Triangular pointer at left is stationary reference. Lines indicate degrees before and after tdc.

TURNING DISTRIBUTOR so that the proper timing mark lines up with reference pointer puts the timing on the nose (right). If you must reach into a mess of wires like this, turn off engine to avoid shock.



to support the ignition wire so that it will not touch bare metal and be shorted out, for then the timing light will not operate. Also, make sure that the timing light leads do not ride next to any rotating engine parts, or the leads may be severely abraded, possibly cut.

Loosen the distributor-arm lock screw or clamp just enough so that the distributor can be rotated by hand. If the vehicle has an "octane selector," set it at "0" before loosening the distributor.

Start the engine and let it idle. Hold the timing light in such a way that its flashes are concentrated directly on the rotating member bearing the timing marks. Rotate the distributor assembly until the timing mark appears under the pointer.

Stop the engine, lock the distributor arm, then start the engine again. Accelerate it, using the throttle linkage on the carburetor, and at the same time observe the timing mark. It should move forward (in the direction of rotation) to indicate that the automatic spark-advance mechanism is functioning. This mechanism, operated automatically by either the engine manifold vacuum or a centrifugal governor, causes a shift of the spark and ignites the gas-air mixture at the most advantageous piston position for each engine speed.

Stop the engine again. Disconnect the timing light and connect the ignition wire to its spark plug. Reinstall the fan belt, if removed, and take up the slack by proper positioning of the generator. Do not get it too tight or you will cause extra wear and tear on the generator bearings and water-pump bushings. The fan belt should be just tight enough so that it can be depressed about ¼" at the center with light pressure.

The final check is a road test. Based on this, you may want to readjust the timing a little for best performance and economy with the gasoline you are using. END

Next Month: Popular Science Monthly will tell you about the tool that road-tests a car while it is standing still—the dynamometer.

TIMING MARKS

Ignition timing marks are found in three spots on U. S. cars—the flywheel (F), vibration damper (VD) or crankshaft pulley (CP).

Buick, F; Cadillac V-8, 1935, F; 1936 and later, VD; Chevrolet, F; Chrysler, VD; Crosley, F; DeSoto, VD; Dodge, VD; Ford, to 1947, none; six, 1948-51, CP; six, 1952, VD; V-8, 1948, none; 1949-1952, CP; Henry J, four, F; six, VD; Hudson, F; Kaiser-Frazer, 1947, F or VD; later, VD; La-Salle, VD; Lincoln, 1935-40, F; 1941-48, none; 1949-52, VD; Lincoln Zephyr, 1936-41, none; Mercury, to 1948, none; 1949-52, CP; Nash, VD; Oldsmobile, six, F; eight, to 1948, F; 1949-52, CP; Packard, six and eight, to 1940, F; later, VD; super eight, VD; Plymouth, to 1938, CP; later, VD; Pontiac, to 1948, F; later, VD; Studebaker, 1935, F; Dictator Six & Commander, VD; Champion, to 1942, F; later, VD; Eight, 1936-37, F; later, VD; Willys Jeep, F; Willys six, VD. Most new cars have marks on damper.

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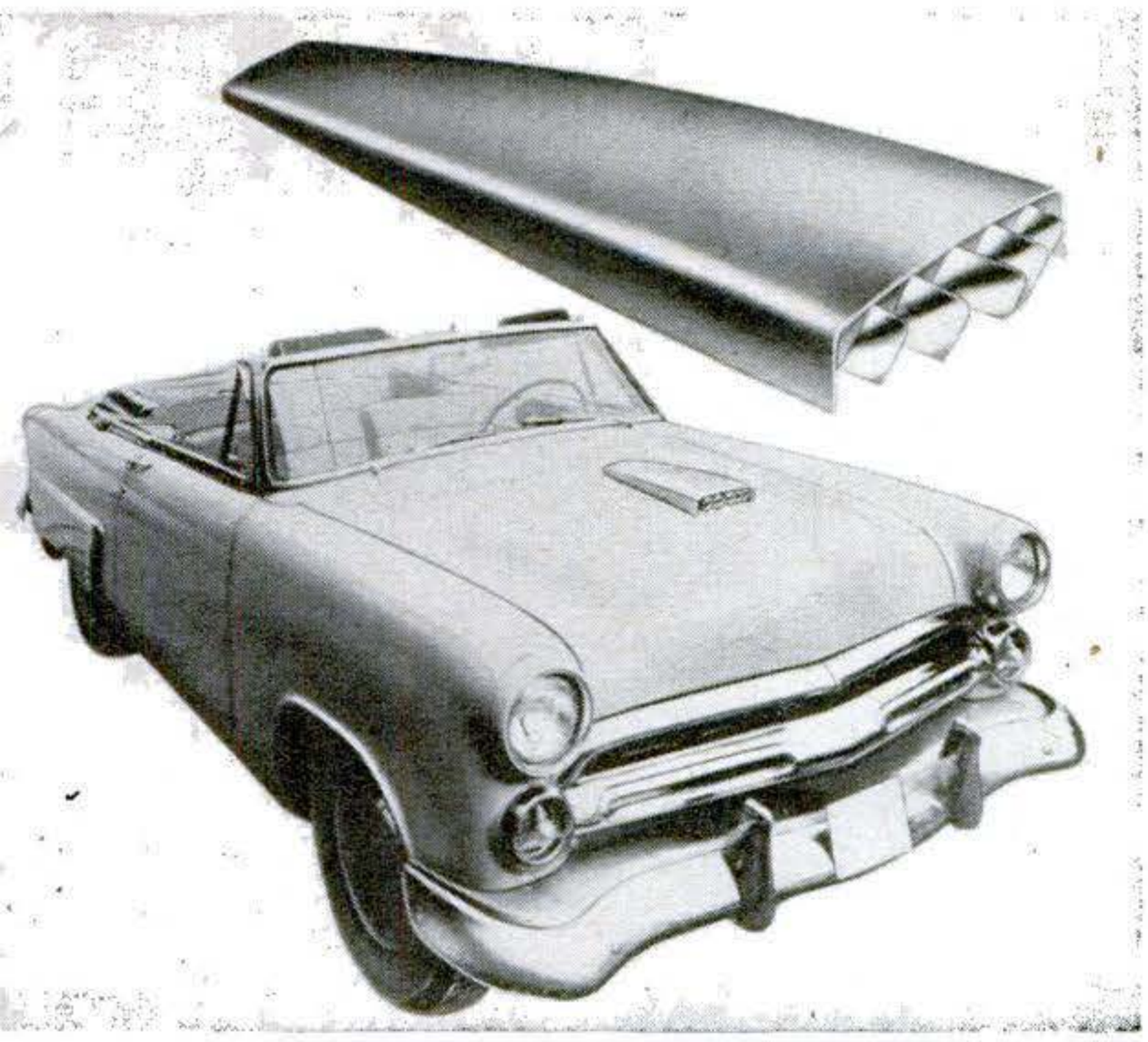
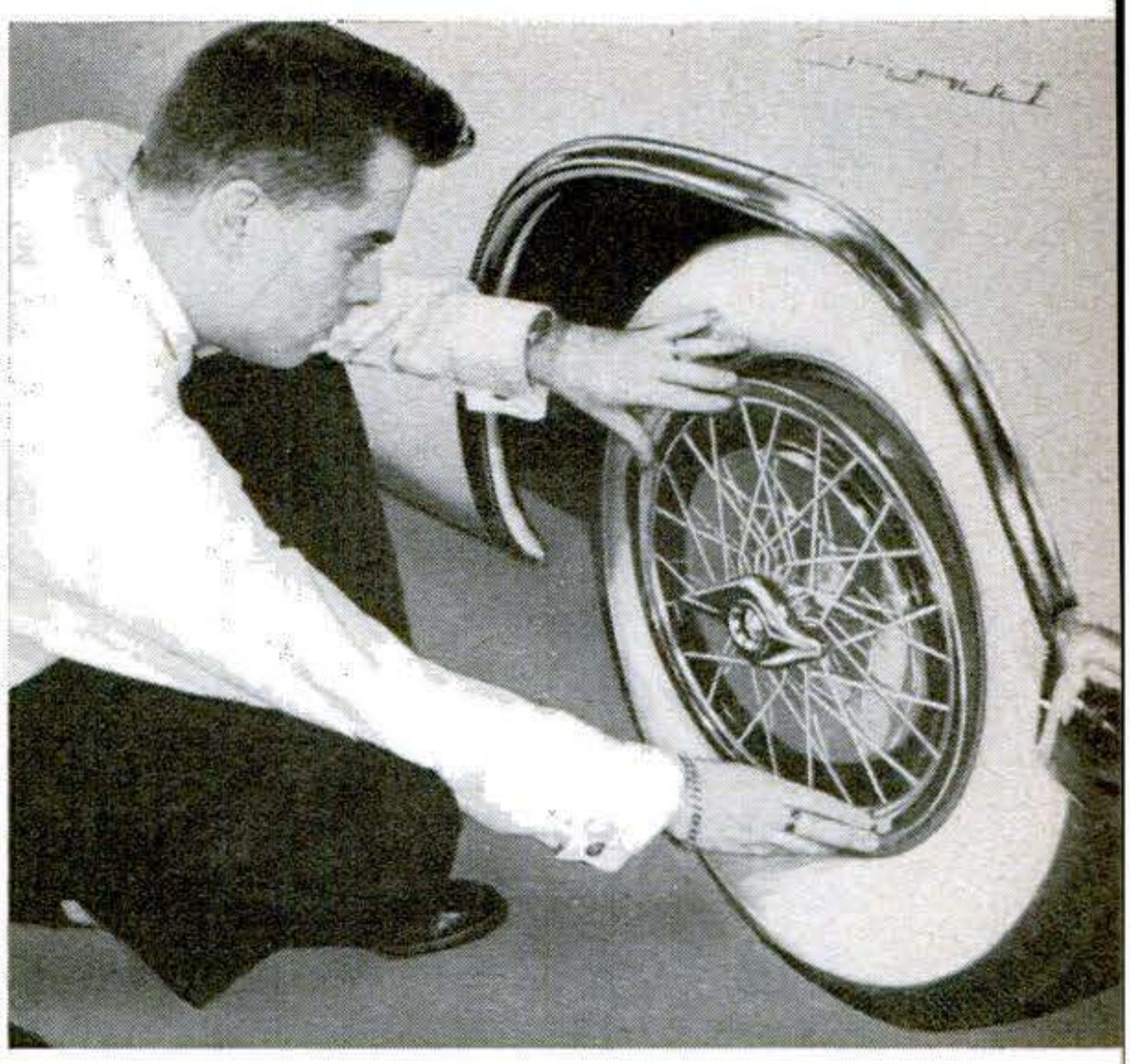


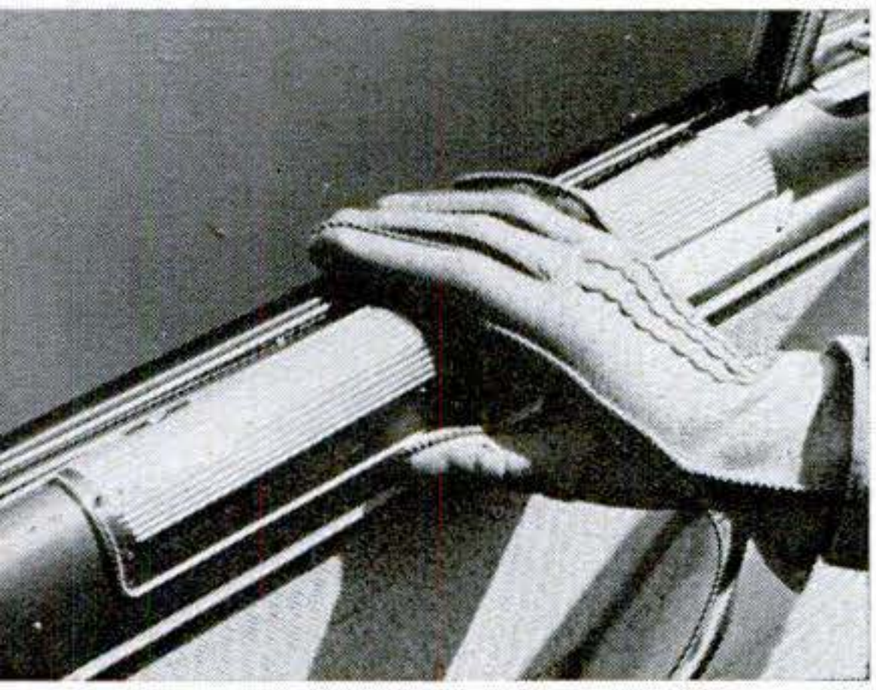
Hood Ornament. A distinctive ornament on the hood will go a long way towards giving a car a custom appearance. You can buy this one plain and paint it to match the car, or get it with chrome finish ready to mount. It is 7¾″ wide and 20½″ long. *Fur Sales, 1031 E. 63rd St., Chicago 37.*



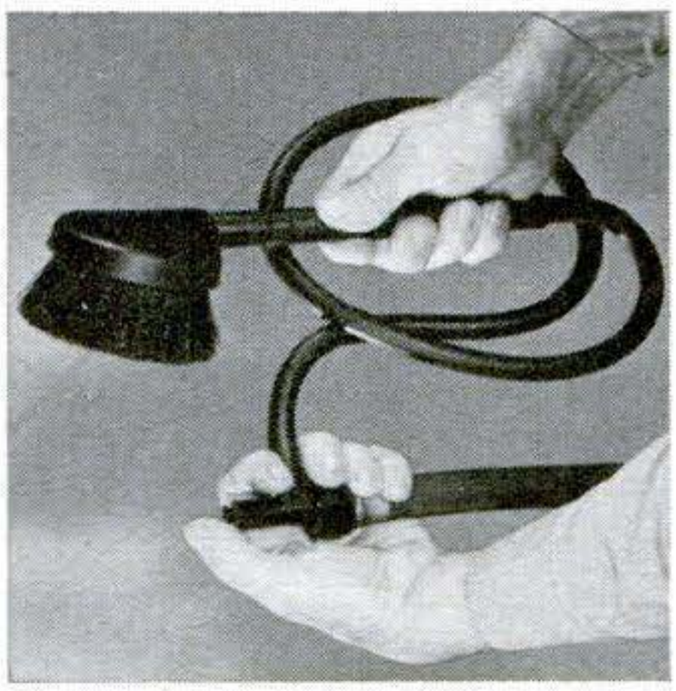
Wire Wheels Snap On. Disks that look like wire wheels are the latest thing to give your car a racy, imported look. Several manufacturers now offer them, and prices vary considerably. The one shown here is made by Automotive Division, Gaylord-Shelton Inc., Chicago.

Brighten Up Your Car for Spring

Here are the latest accessories to give it that snappy look.



Protect the Sill. The sill of the driver's window is always one of the first spots on a car to become shabby. The new Protect-O-Sill, made of plastic, will prevent or hide this wear. Available in red, blue, green and amber, it simply clips on the sill. *Tenna-Lite Corp., 312 W. Illinois St., Chicago 10.*



For Washing Your Car. This fountain brush includes a needle valve that screws on a standard hose, enabling you to control the water flow with one hand while you manipulate the brush with the other to wash your car. *Free Action Fountain Brush Mfg. Co., 4629 13th Ave. South, Minneapolis 7.*

Frame Your Plates. A flexible frame molded of Vinylite will set off your license plates and protect the edges from scuffing. Just stretch the frames around your plates. Frames are available in black or white in sizes to suit the plates made by different states. *John Carlson & Sons, 12 Cass St., Springfield, Mass.*

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Gus Answers an Ambulance Call

After one little session as Doc Tandy's helper, Gus was very glad indeed that automobiles never suffer from acute appendicitis.

By Martin Bunn

GUS WILSON watched the smoke from his pipe drift indolently toward the ceiling while Doc Tandy poured another round of coffee.

"You know, Gus," the Doc was saying, "I'm glad you came over. I haven't sat down for a good bull session like this for a long time. A man gets tired of talking and thinking with 60-buck words and medical terms. I couldn't have prescribed a better medicine for this old carcass of mine."

"Well heck, Doc, I'm tickled pink to see you standing still for a change." Gus savored the hot coffee. "When was your last vacation?"

"Long ago." Doc shrugged. "There aren't enough doctors in town as it is. But I'm used to it. I should think you have pretty much the same problem, Gus."

"At least I usually get away for a week or two each year."

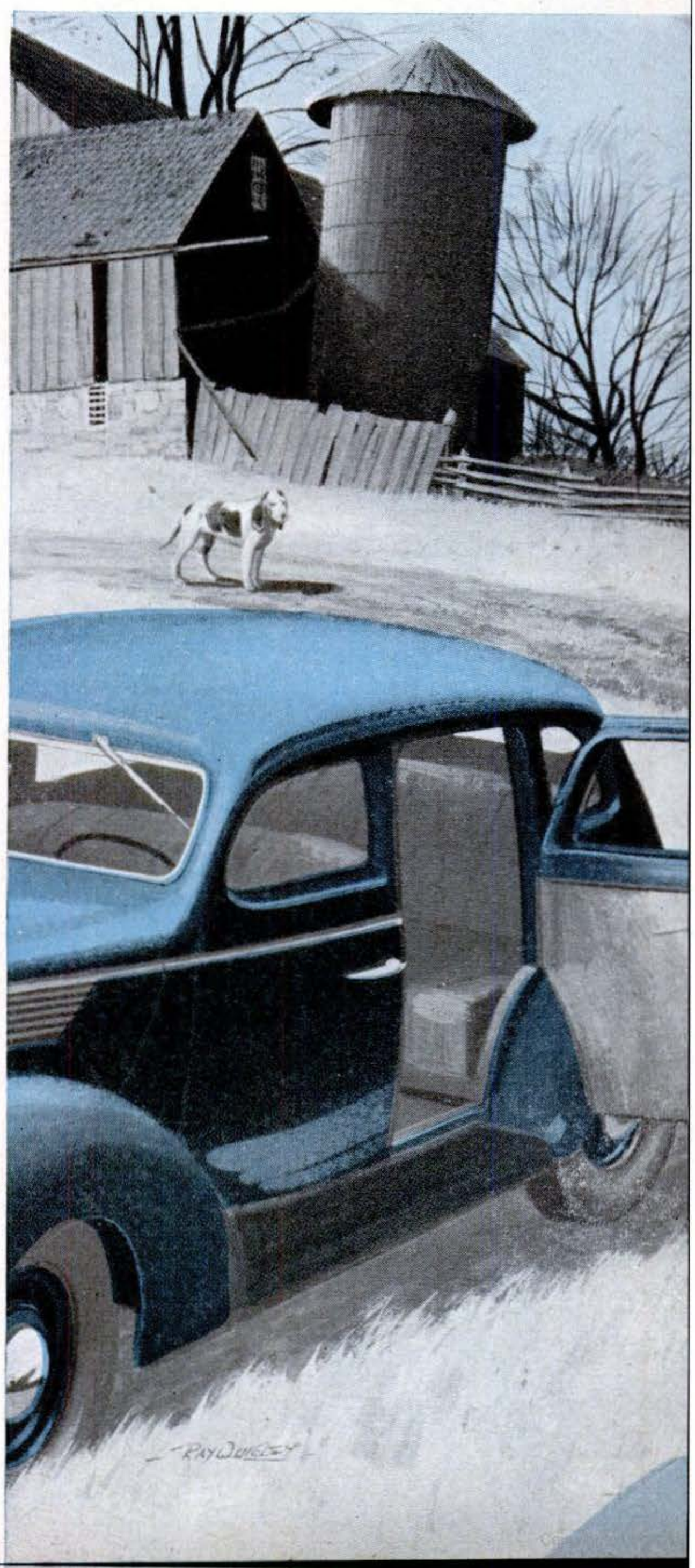
No Rest for the Weary

The phone rang softly on Doc Tandy's desk.

"See what I mean? Even on Sunday." The snow-haired man smiled and went to answer it.

Gus stirred his coffee slowly and stared through the window at the budding leaves on the trees outside.

"Looks like I'll have to interrupt this enjoyable session to soothe a pet hypochondriac of mine. Bill Williams, up on Waltham Road. Claims he's dying of appendicitis, and between you and me, he's been dying of it



off and on for several years. Bill's a bachelor, and I'll lay odds he's just got a dose of his own cooking again! Want to go along? It'll be a pleasant drive if nothing else."

"Sure, Doc. Why not?"

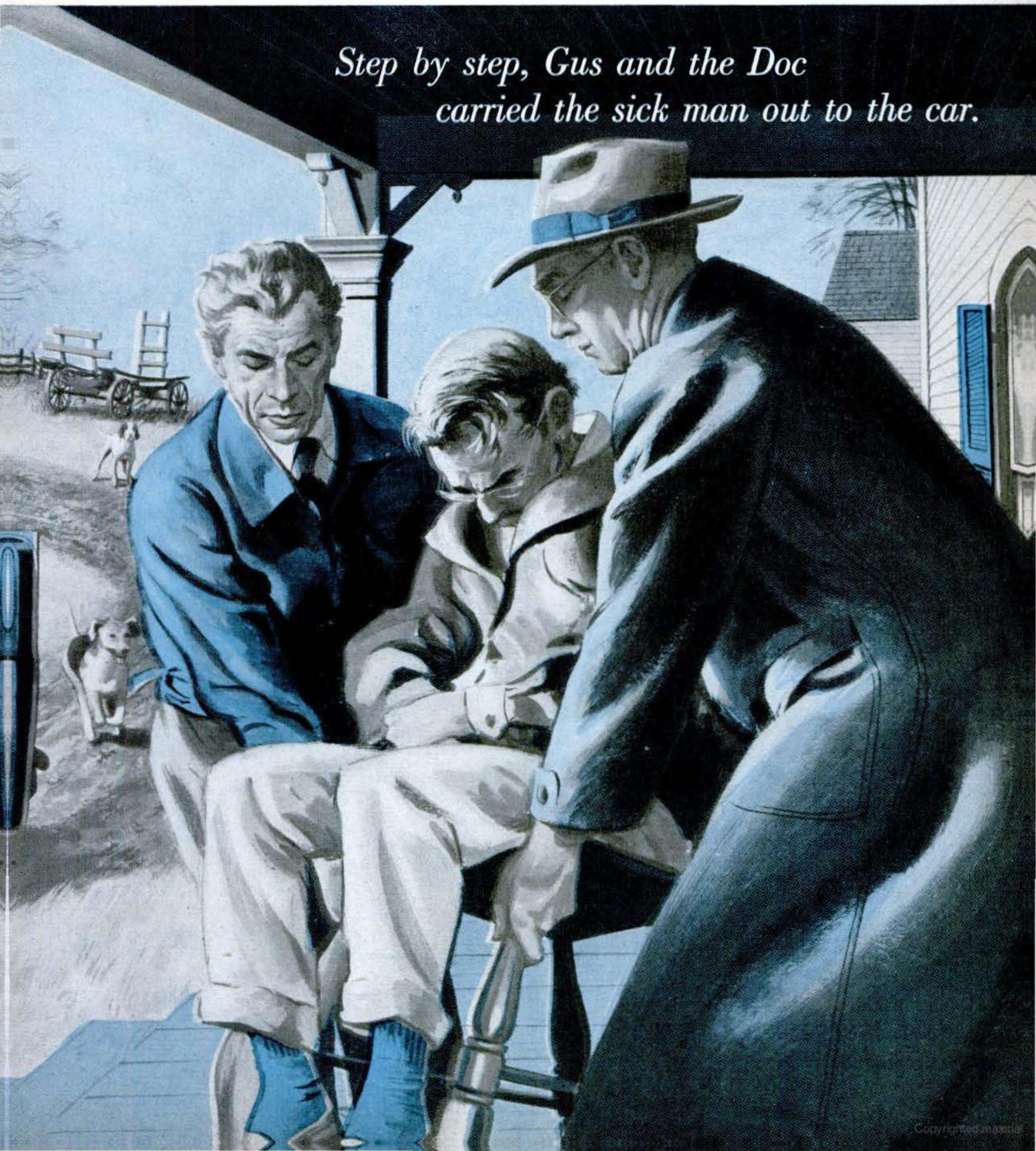
"Let me get my bag. I've got some belly-ache medicine in it that makes castor oil taste like maple syrup in comparison! Bill is one of those people who thinks medicine has to taste horrible to be any good."

They went out to the driveway and climbed into a battered 1940 sedan. As Doc backed her out, he said, "Glad to have you along, Gus. I don't trust this old heap, but my wife's gone visiting in the new car, the one I usually drive on calls."

After three-quarters of an hour of peaceful driving, Doc eased on the brakes and turned off onto Williams' road. He stopped in front of a porch cluttered with hounds.

"This is it. I'll be out in a minute, Gus."

Doc Tandy fixed a serious expression on



Step by step, Gus and the Doc carried the sick man out to the car.

his face, straightened his coat, picked up his bag, and winked at Gus before walking up the front steps.

Five minutes passed, and then 10 before Doc came out again. When he did, his stern expression wasn't for the benefit of his patient. It was white and real in his face.

Williams Wasn't Fooling This Time

"Gus, can you help me move him to the car? It's not his imagination this time—it's acute appendicitis. Another hour and it'll burst."

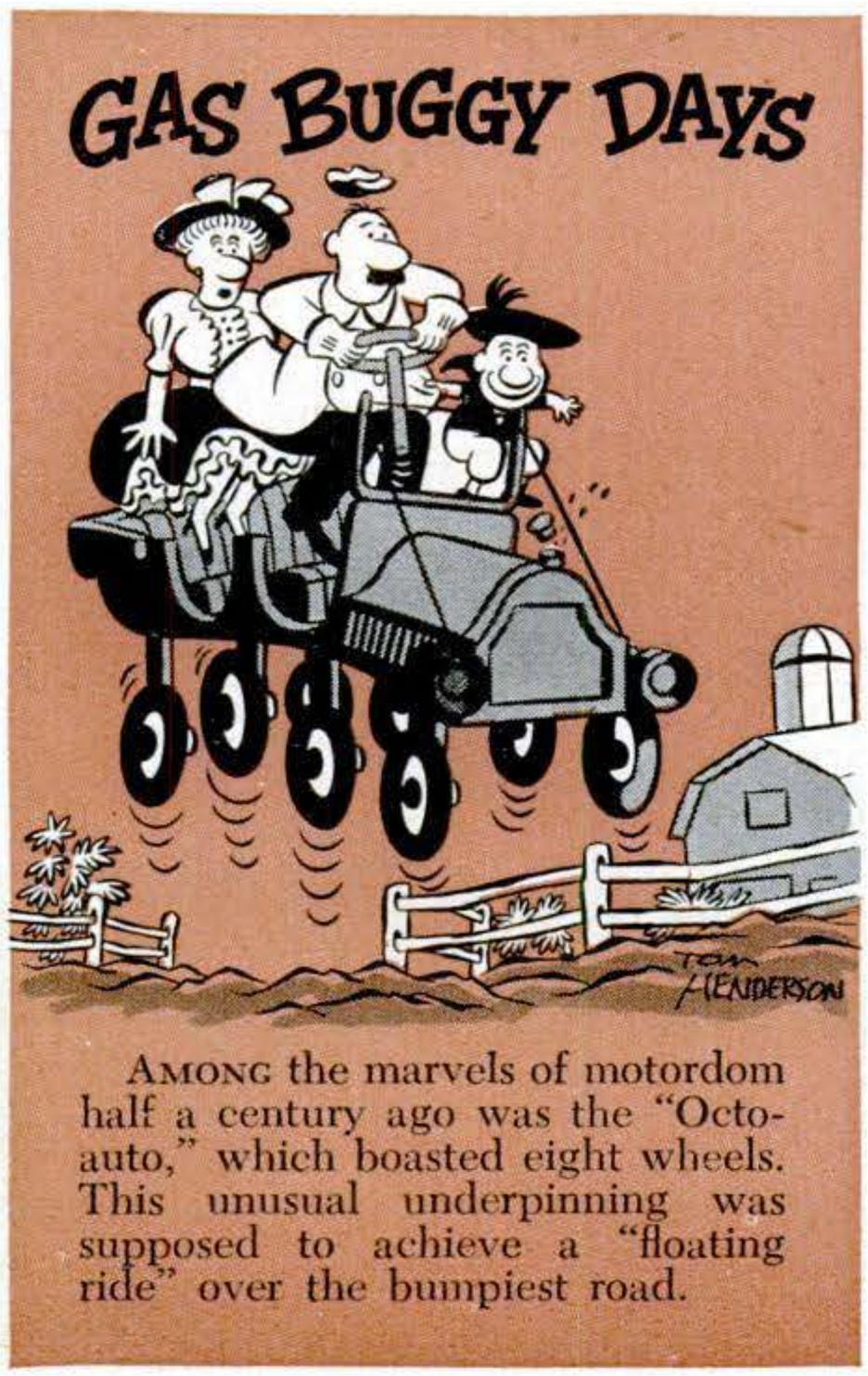
Gus scrambled out of the car and followed Doc Tandy inside to a dimly lit bedroom. Bill Williams lay doubled up on an old brass-headed bed.

"Ease him into this chair, Gus. It'll be less rough on him than for us to try to carry him stretched out. Move slowly and gently. Okay, easy now . . . easy . . . don't try to straighten him out."

Step by step, they carried the sick man to the car, and Doc made him as comfortable as possible in the back seat.

"You drive, Gus. I'll stay back here and keep an eye on him."

Gus turned the car around, and began the nerve-racking business of avoiding every bump in the road without losing time.



AMONG the marvels of motordom half a century ago was the "Octo-auto," which boasted eight wheels. This unusual underpinning was supposed to achieve a "floating ride" over the bumpiest road.

"You say we've got only an hour, Doc?"

"That's just a guess. It could last another day without breaking. But I have a feeling it won't take that long. Hope I'm wrong."

"What happens if it does break?"

"Peritonitis, Gus." Doc leaned close from the back seat. "Poison spreads through his whole system. Have to act fast or . . . well, it can be fatal."

Gus concentrated on his driving and tried not to think about it.

They came to a steep hill a short time later, and halfway up, a cow began crossing the road.

"Probably been standing there all day, waiting for a car to come along," Gus said wryly, and slowed down. "Never have seen it to fail."

When the ambling animal reached the other side, Gus stepped on the gas, but the surge of power wasn't there. The car faltered and stalled. Gus pulled on the brake, and hit the starter button. The starter failed to work.

"Oh no!" Doc groaned. "Not again! Not at a time like this."

"Had starter trouble before?"

"Yes, once, a couple of weeks ago. Then it went away. I should have known better than to trust it! What are we going to do?"

Gus climbed out and lifted the hood with nervous fingers. It was a bad time for this to happen, with a sick man in the car.

Gus knew why the car had stalled. He had felt flat spots even in slow acceleration since they left the farm. The carburetor was set far too lean. But that had nothing to do with the starter. The battery was good and strong, and yet, when the starter button was pressed, nothing happened.

"Doc, your carburetor was set too lean. But I can't adjust it until I find out what's wrong with the starter and get the engine going."

Doc shook his head helplessly. He was busy keeping Williams calmed down. Gus started looking for the trouble.

He examined the starter motor first. No loose connections; no bare wires. Without tools, he couldn't take the motor apart, but from what he could see, and from what he remembered of its sound back in Doc's garage and in the farmyard, there was nothing wrong with it. Starter motors were a pretty durable commodity.

Gus Draws a Blank

He traced the wires to the battery, and still found nothing. From there he went along the maze of wires to the starter button on the dash.

[Continued on page 252]

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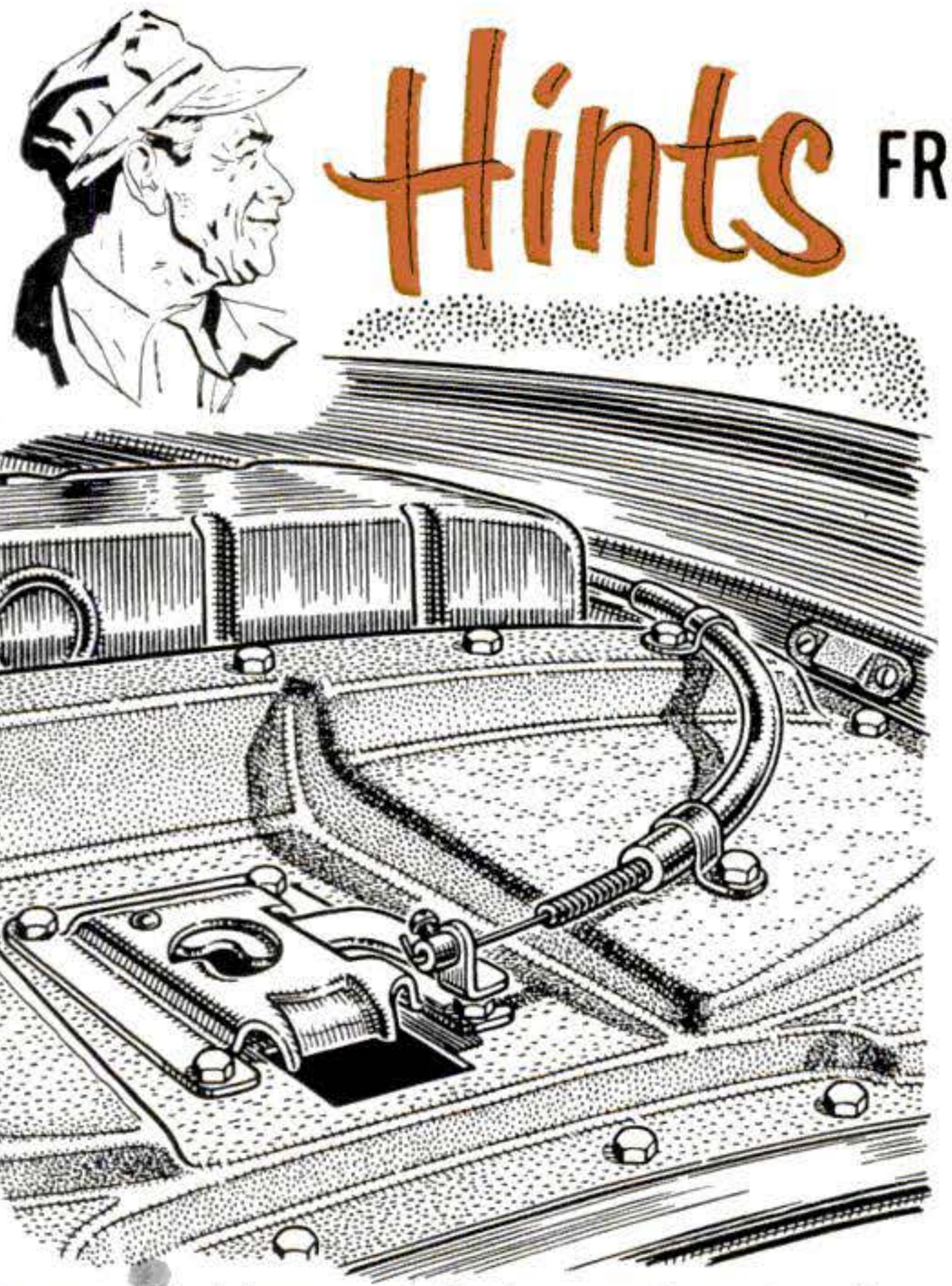
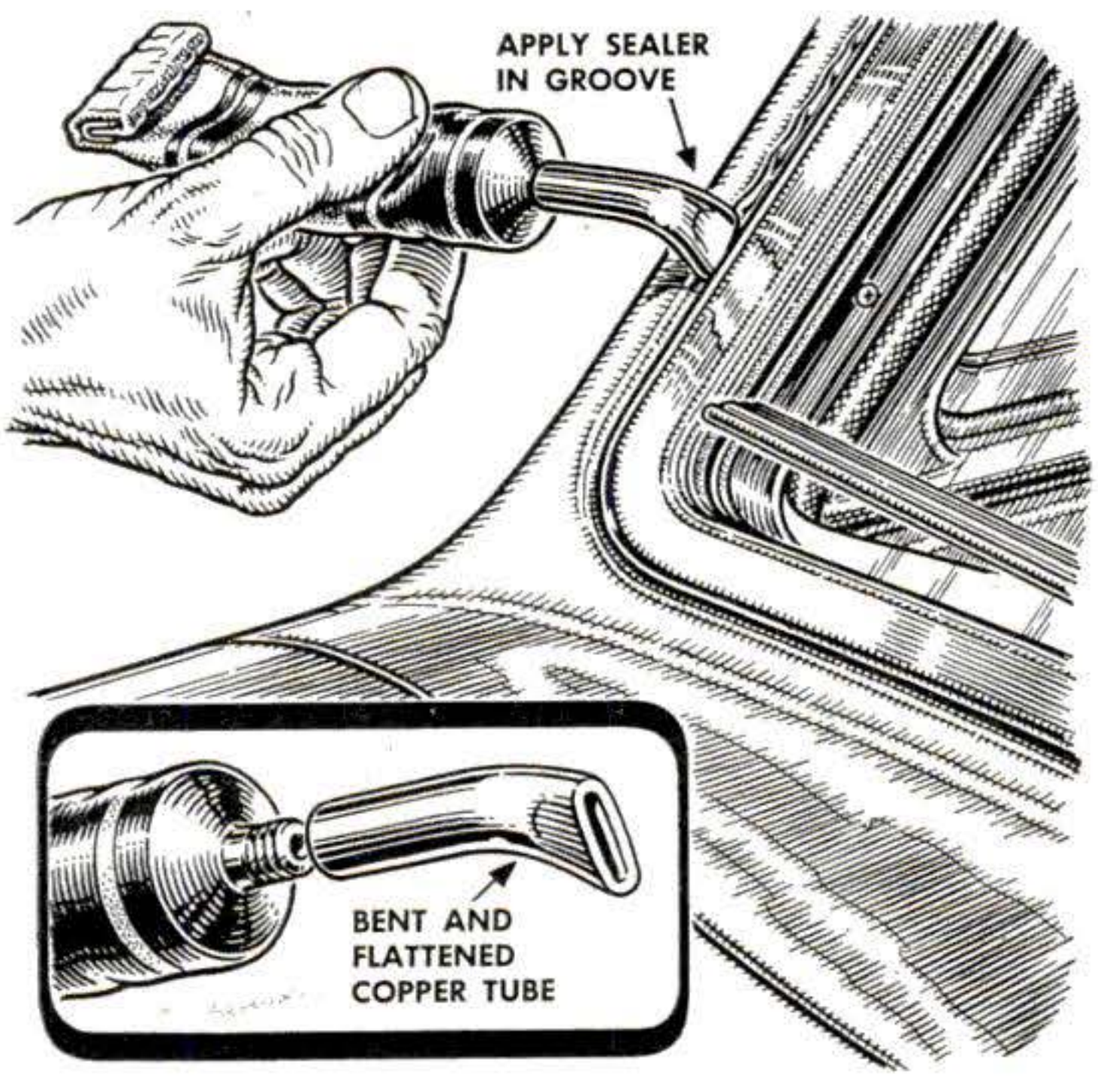
Hints FROM THE MODEL GARAGE

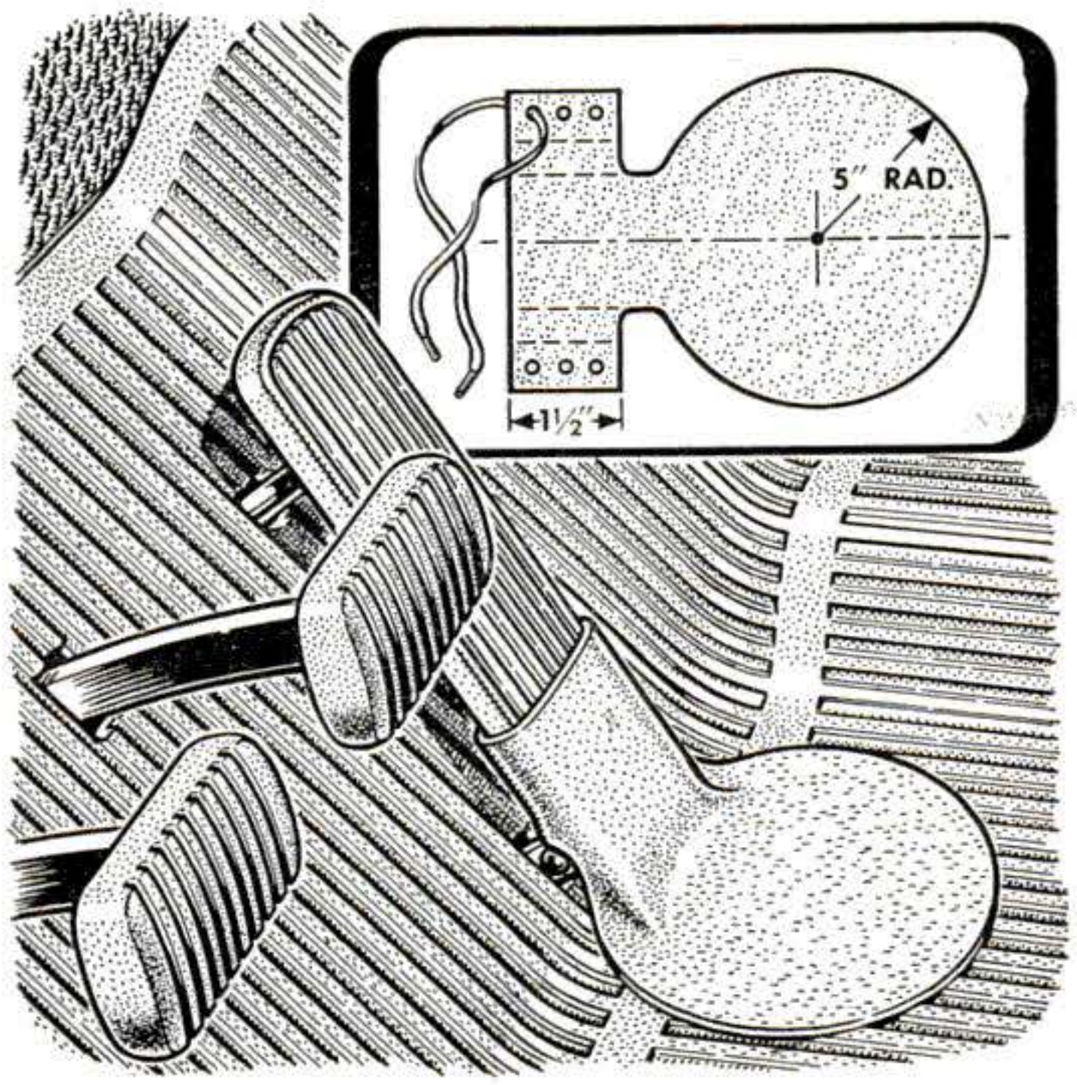


Copper tubing installed as a housing for flexible control cables running to hood-release mechanisms and heaters will eliminate lost motion and buckling. In the case of a hood release, the hold-down bracket can be placed over the tubing.

A tailpipe extension can be made from a piece of radiator hose. Force a piece of hose about 6″ long over the end of the tailpipe and apply aluminum paint. Extend the hose beyond the bumper so that the chrome will be protected.



In applying sealer around a windshield, it is often difficult to press the fluid out of the tube without getting it all over the glass. A short piece of copper tubing placed over the end of the spout like this will help you do the job.



A rubber heel pad attached to the accelerator as shown above will stave off those unsightly holes in the floor covering. The pad can be cut from an old inner tube. Tie the end of it around the base of the accelerator pedal.

Please turn the page for more auto hints.

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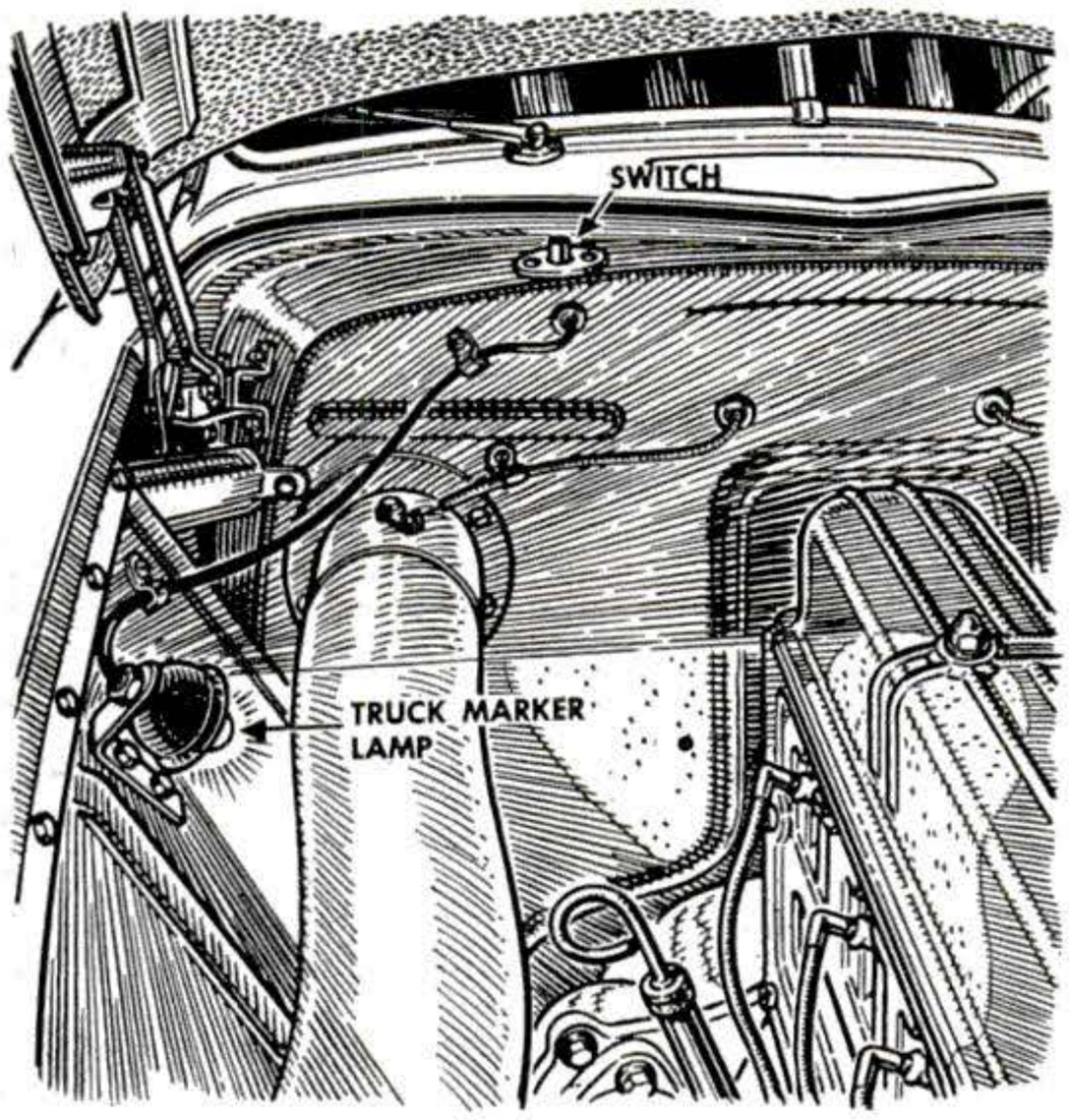
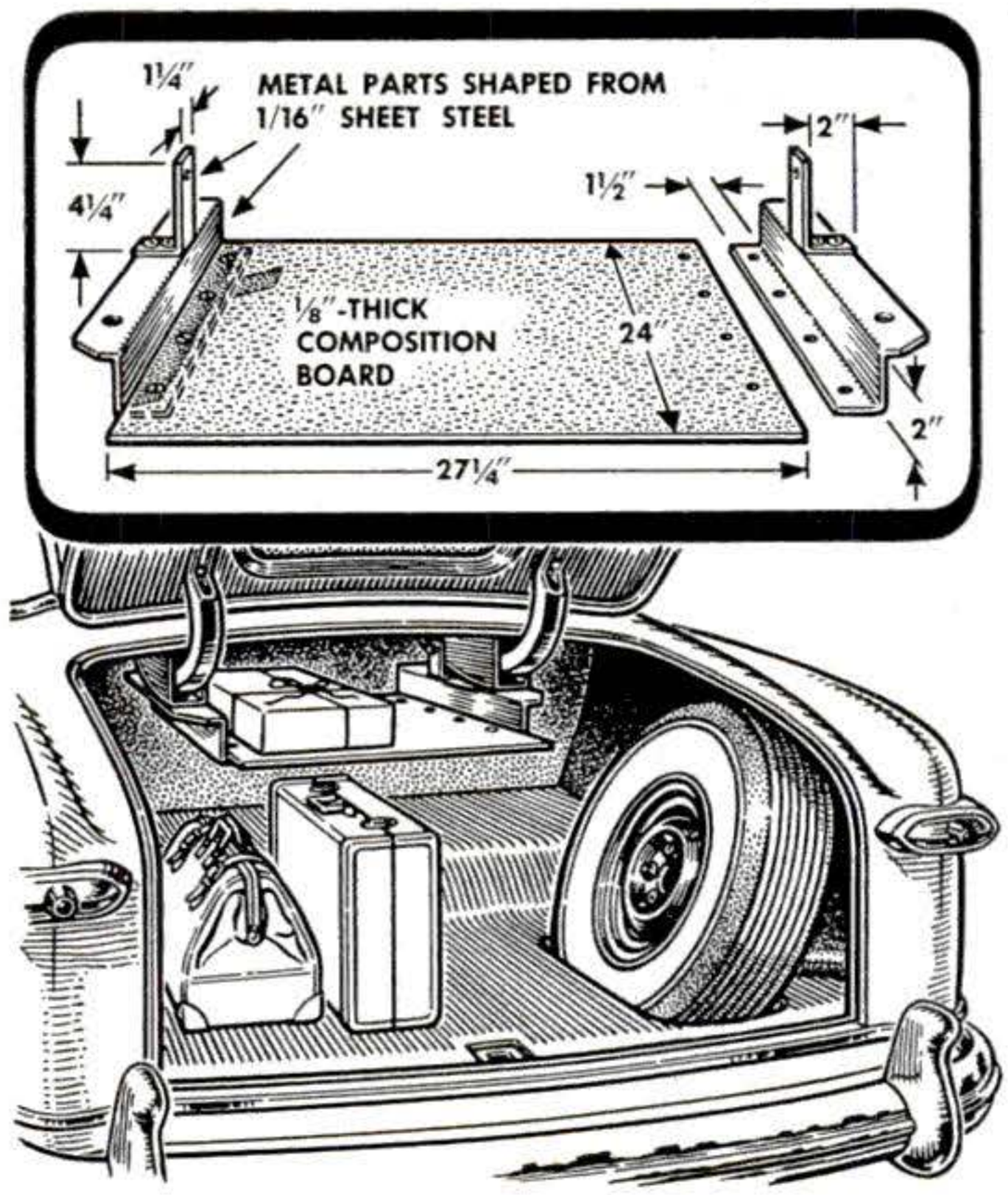
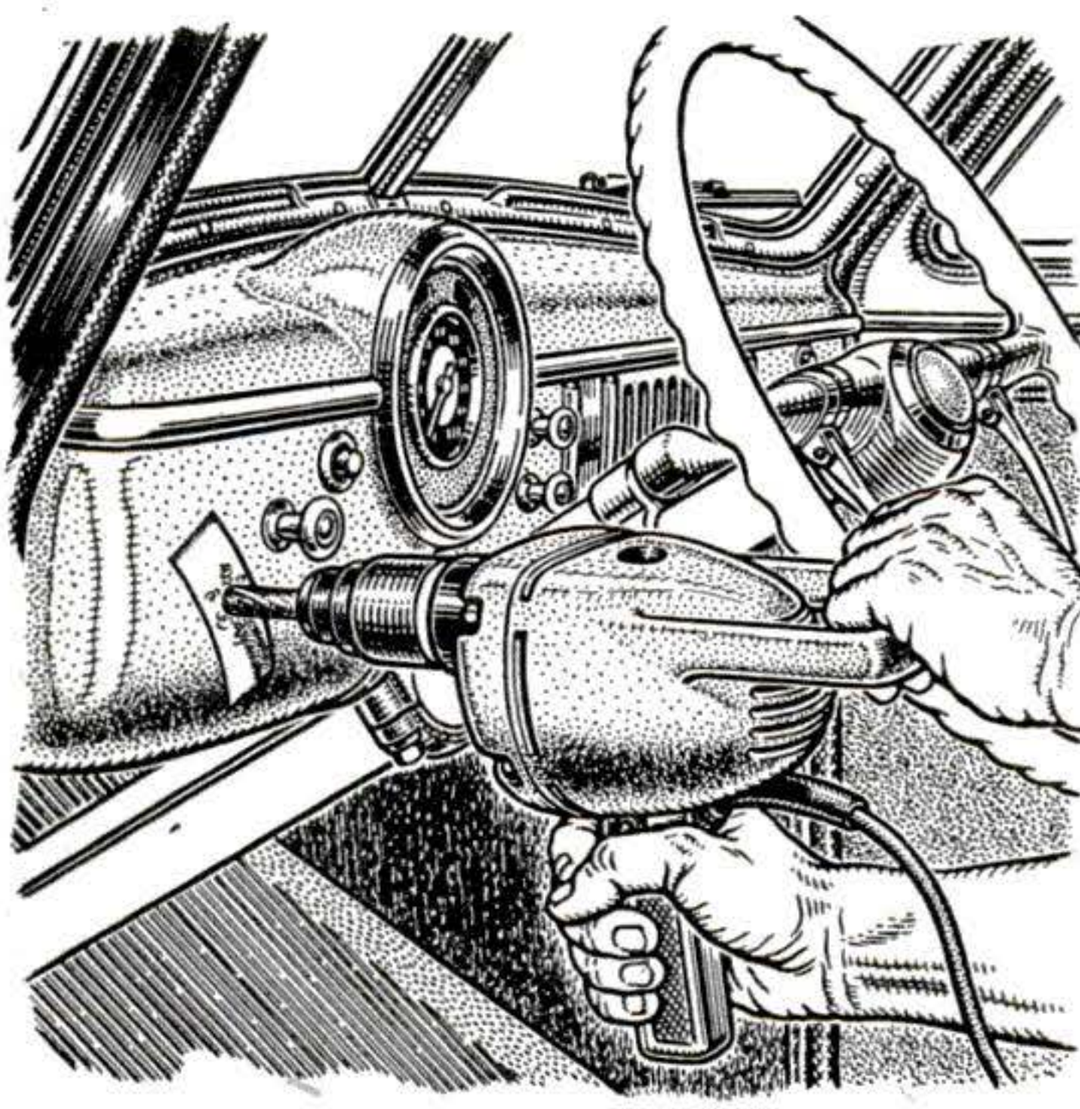
MORE Hints from the Model Garage



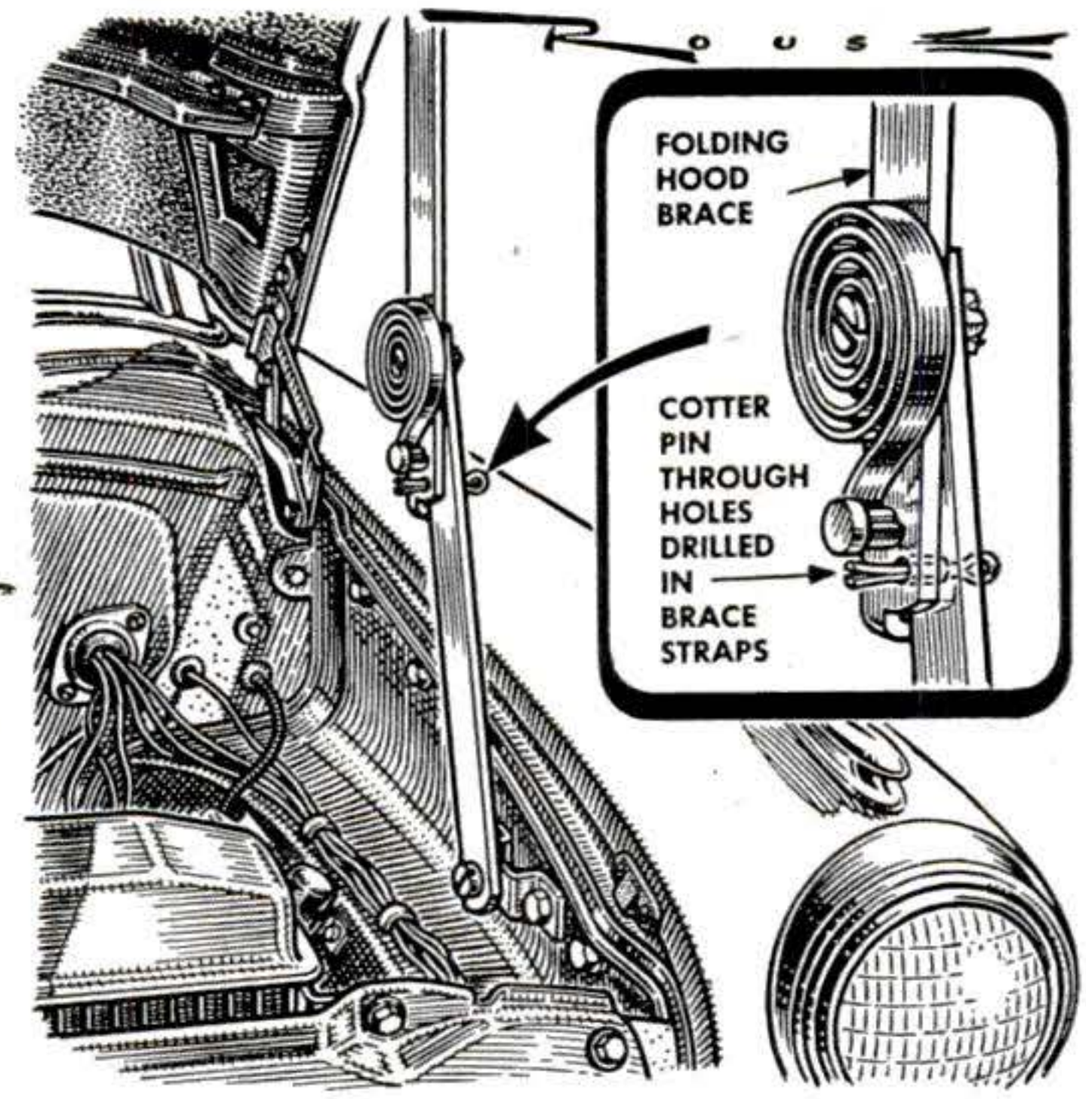
An under-hood light is easy to install. Buy a truck marker lamp from an auto-supply store, remove the red glass and bolt the light to the side of the engine compartment. Aim it to shine on the dipstick. Then mount a car-door switch so that the descending hood will turn it off. Run a lead to a hot wire and the job is done.



Small packages will be kept out of harm's way in a luggage compartment if you build a light shelf like this one. It is attached to the hinge guards by bolts and wing nuts so that it can be removed when you need maximum space. The dimensions given suit a 1951 Ford but can be adapted to other cars. Be sure to leave clearance for trunk lid.



In drilling any part of the car metal to install accessories, first stick a piece of tape over the site of the proposed hole. Then centerpunch the hole and start drilling. With this precaution, the chance of damaging finish around hole is greatly lessened.



A hood that is supported by tension springs may develop a habit of falling when the springs weaken. To make it safe, drill a small hole through the brace straps with the hood up. A cotter pin slipped in the hole will then keep the hood from falling.

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shop. For the most attractive results, select boards having a fairly marked grain. Wire-brushing, by carrying away the soft material, will give the surface of the wood a three-dimensional nature.

The process is ideally suited to pine furniture, especially wide expanses such as table tops. It works well on redwood, too, and on practically any lumber you can name. Give the surface a good sanding first to clean it up. But don't fret about small pitch pockets and other defects, because wire-brushing helps hide them.

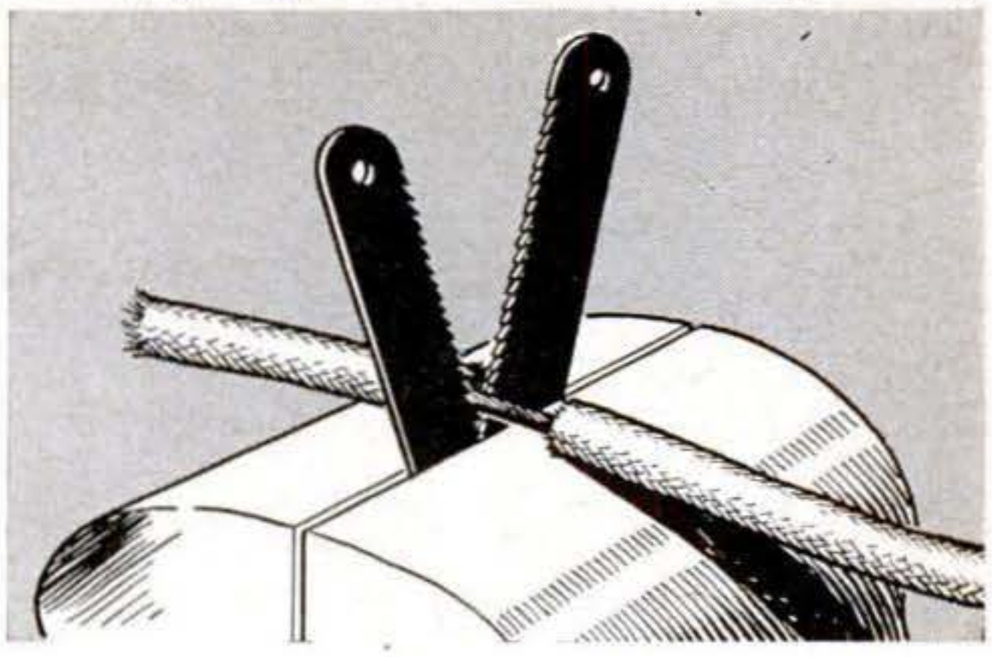
After you have brushed the entire surface with the grain, sand it lightly and wipe off the dust. Apply a coat of white-pigmented resin sealer (white Rez, white Firzite or the like). Put it on liberally with a brush or rag, let it get almost dry, and then wipe it with a rag, leaving just enough white pigment for a blonding effect. Let this dry for four hours or so.

Tinted sealer. For the next coat, add enough raw umber to make the white sealer a soft neutral gray. Apply and wipe this in the same way you did the untinted sealer. You can control the depth of tint by the amount of umber you use and by how soon you wipe. You can also hide defects and uneven color in the wood.

Finally, brush on two coats of clear resin sealer, sanding very lightly before each coat. On woods where you prefer to retain a natural finish, apply two or three coats of water-clear lacquer instead of the sealer.—*Darrell Huff, Sonoma, Calif.*

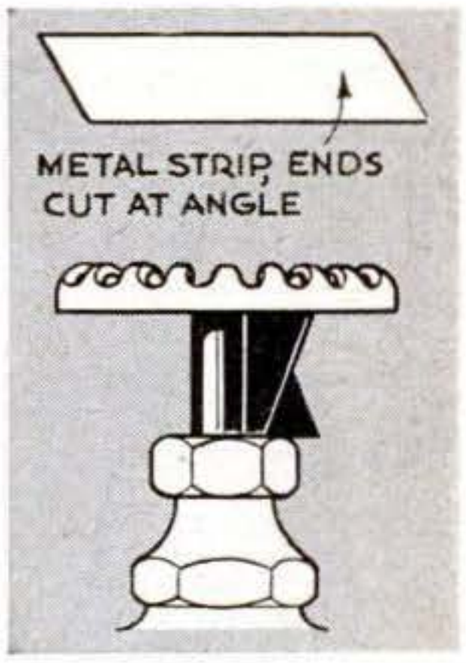
FINISH SPARKLES after application of filler. If you find this gloss excessive, rub it when dry with oily rag dipped in powdered pumice.

Stripping Wires the Easy Way



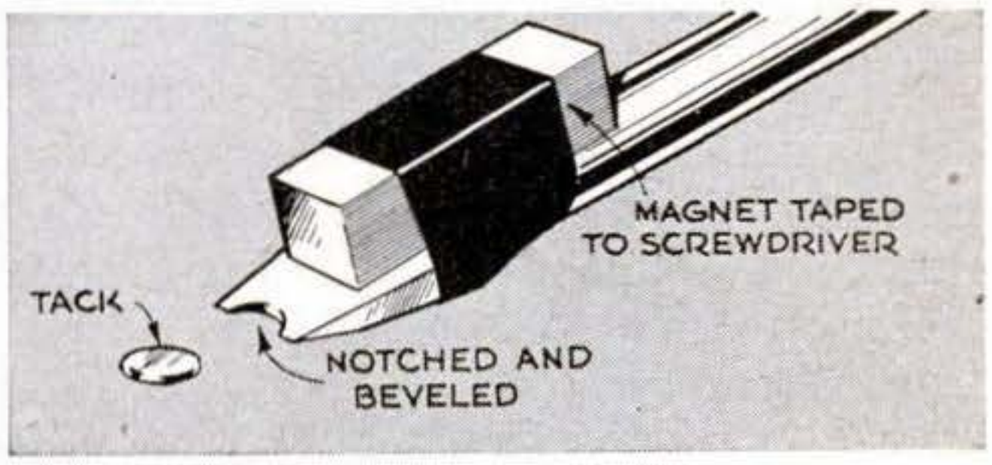
PEELING insulation off the ends of wires is a simple job when you use a broken hacksaw blade in a vise. Lock the blade parts in a vise to form a V but leave a little separation at the bottom of the V. Force the wire down into the V with a twisting motion. This cuts the insulation but doesn't damage the wire because of the separation at the bottom of V. Then pull on wire to strip insulation.—*Hugh Lineback, Stillwater, Okla.*

Safety Catch Fits Valve Stem



TO PREVENT turning off a valve by accident, a lock can be made of scrap sheet metal. This is useful on installations where accidental shut-off could cause damage—such as in the line to a hot-water heater or a refrigeration compressor. Trim a strip of metal so it will just fit on the opened valve stem, and crimp it in place with pliers. When desired, the catch can be easily removed.

Magnet Holds Removed Tacks



TAPE a small magnet to a tack puller to hold a tack as it is withdrawn. You can make a tack puller from an old screwdriver by sharpening and notching the blade with a file.—*Frank Shore, NYC.*

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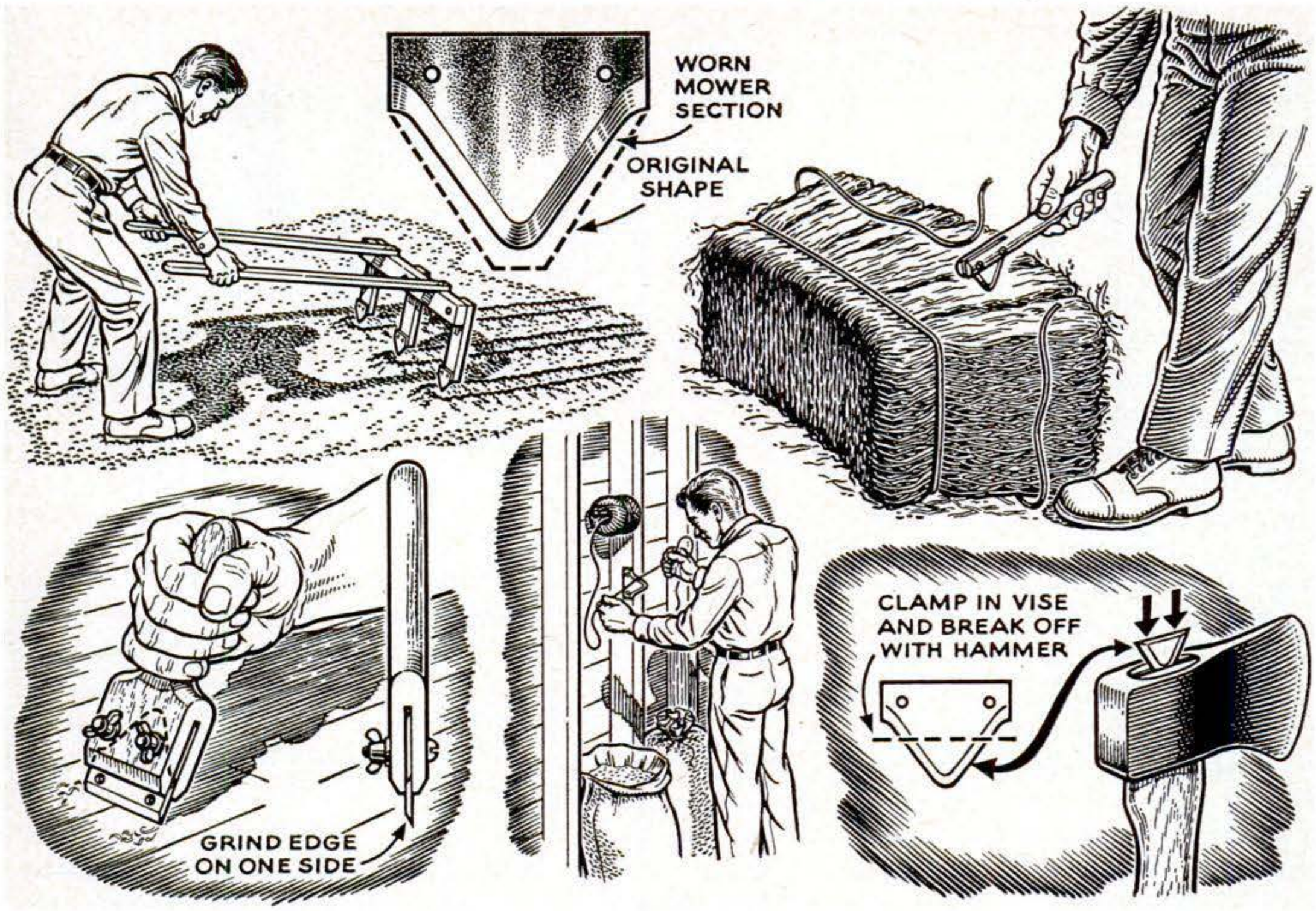
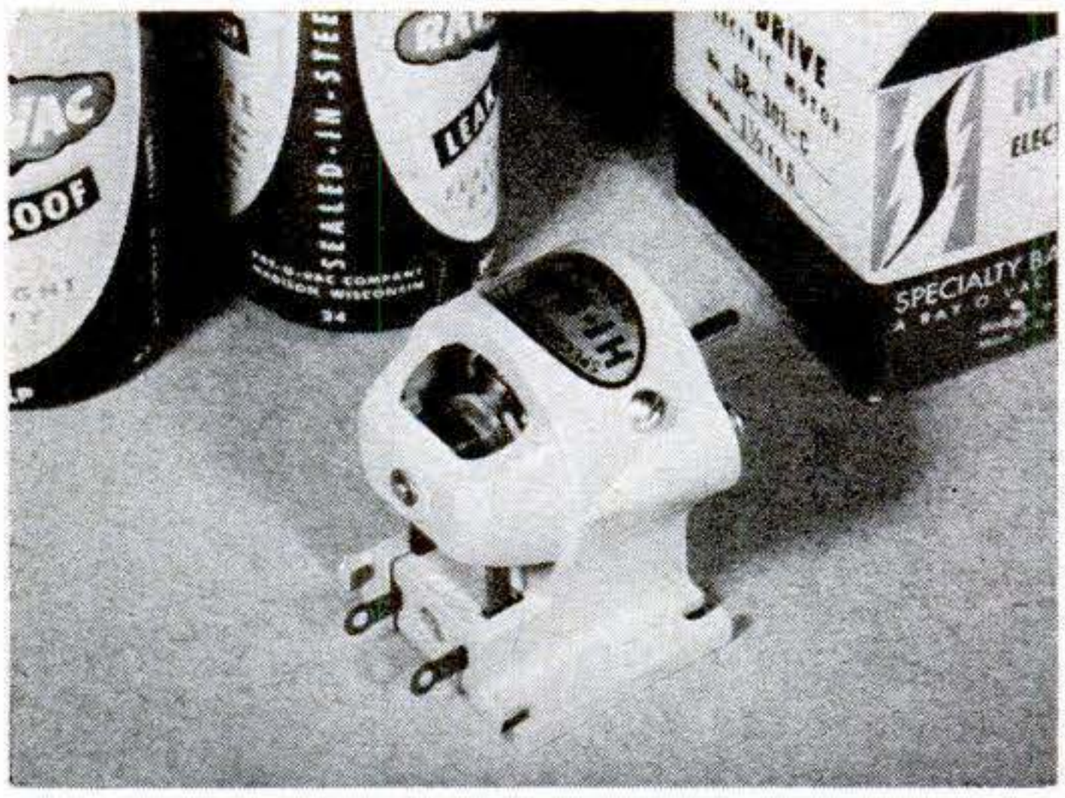
Discarded Mower Knives Can Be Put to Work at Many New Jobs



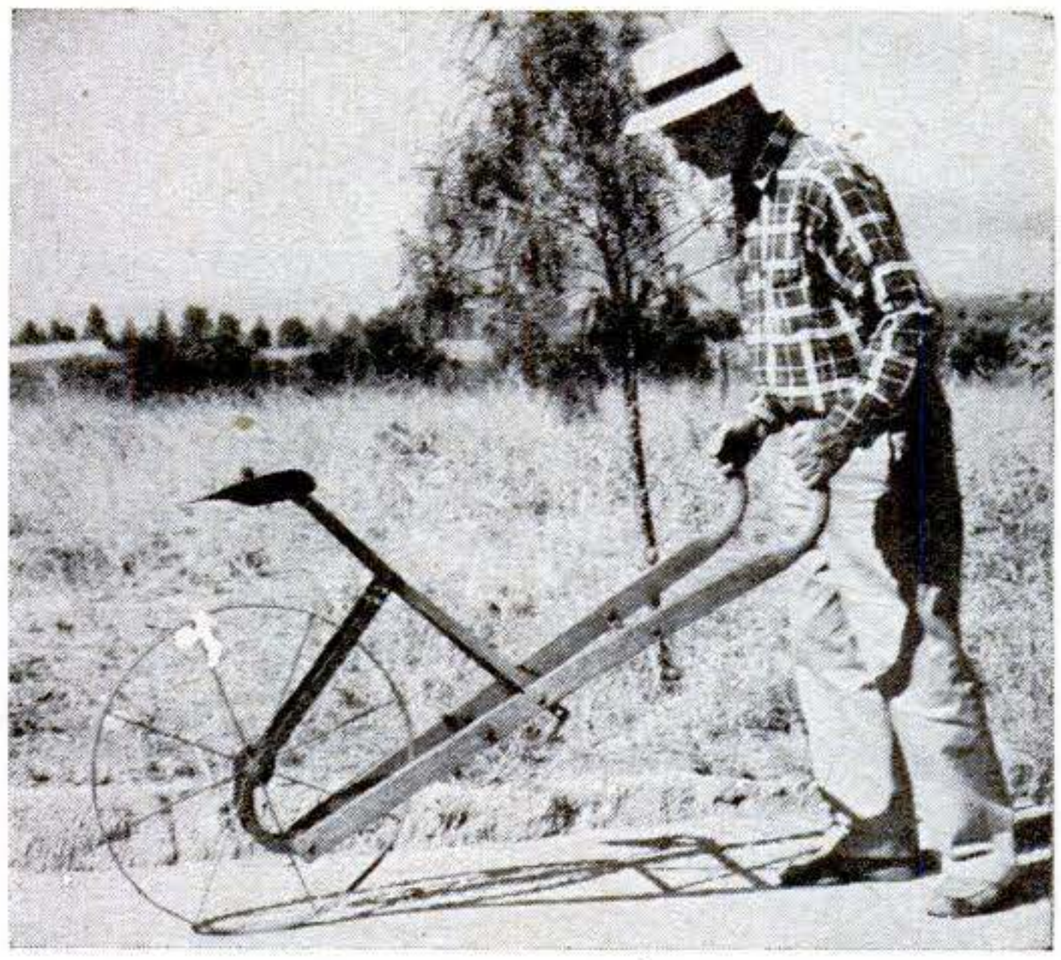
OUTWORN mower knives, left to rust in many a barn, have lots of salvage uses. They'll make a neat row marker for the garden, handy twine cutters, cabinet scrapers (grind carefully to hold temper), and ax-head wedges.—*R. S. Wilkes, Keuka Park, N.Y.*

Tiny Motor Has Carbon Brushes



DESIGNED for models, automatic controls and toys, this new 1½- to six-volt midget motor comes with either phosphor-bronze or carbon brushes. A single screw holds the brush assembly, which is renewable. Bronze shaft bushings are molded into the plastic housing. At three volts, the motor draws .155 amp., running free at 3,900 r.p.m. (bronze), 4,900 r.p.m. (carbon). *Specialty Battery Co., 212 E. Washington Ave., Madison 10, Wis. About $2.60.*

Cultivator Measures Distance



I USED my hand cultivator, a rag tied to one of its spokes, to measure the distance around the house for building a fence. As I pushed the wheel along the line of the proposed fence I counted its revolutions. The wheel's diameter multiplied by pi, 3.14, gave the distance covered in one revolution.—*Hi Sibley, Nuevo, Calif.*

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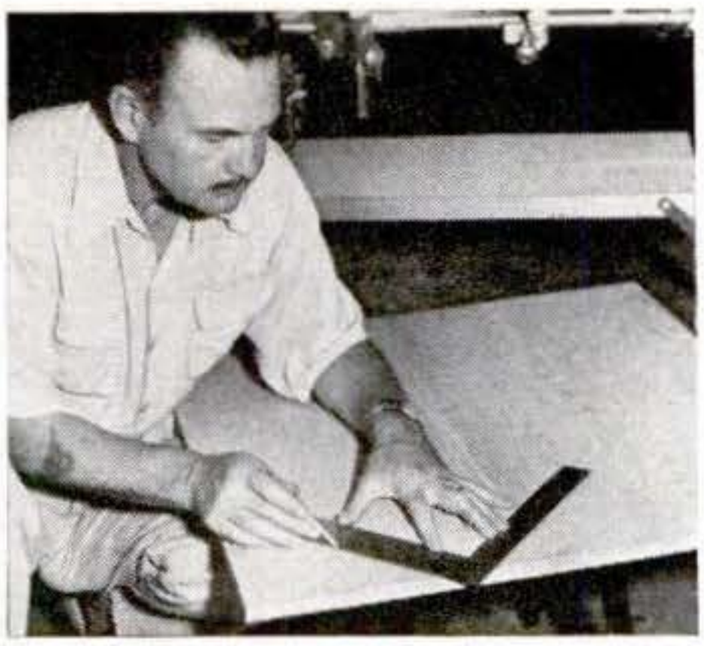

An Expert Craftsman Builds a Coffee Table

Let's peer over Shep Shepherd's shoulder and learn a few of the many professional tricks he uses in even a simple woodworking project like this.

Table top turns like Lazy Susan. Blond finish on ash wood stands out nicely against the dark wall in builder's California home. Turn page to see how it was built with less than $10 worth of materials (listed at right).

JOHN SCOTT
HARDWARE SUPPLY
300 FIRST AVENUE

30"x30" sheet 3/4" ash plywood
10' 2"x2" ash
9' 1 1/2" molding
1 3 1/4" pc. 1 1/4" dowel
3 pcs. 18"x18" hard-surfaced comp. board
2 doz. FH screws 1 3/4" long
4 FH screws 2 1/4"

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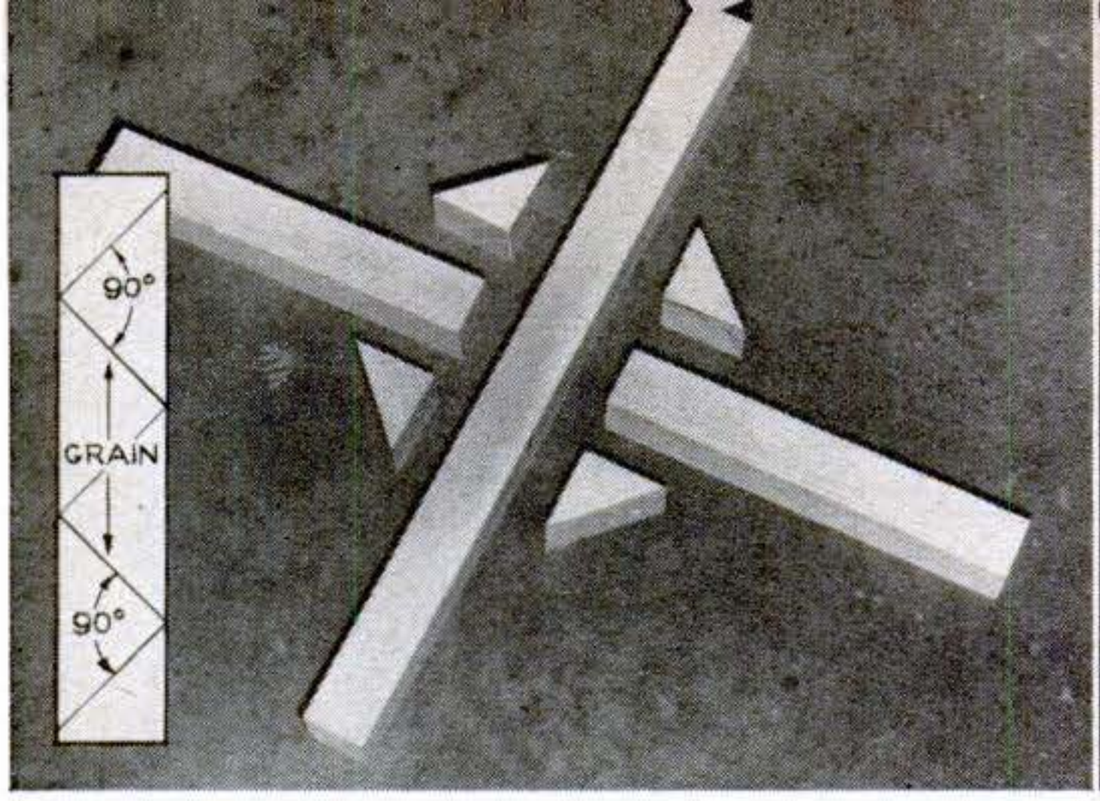
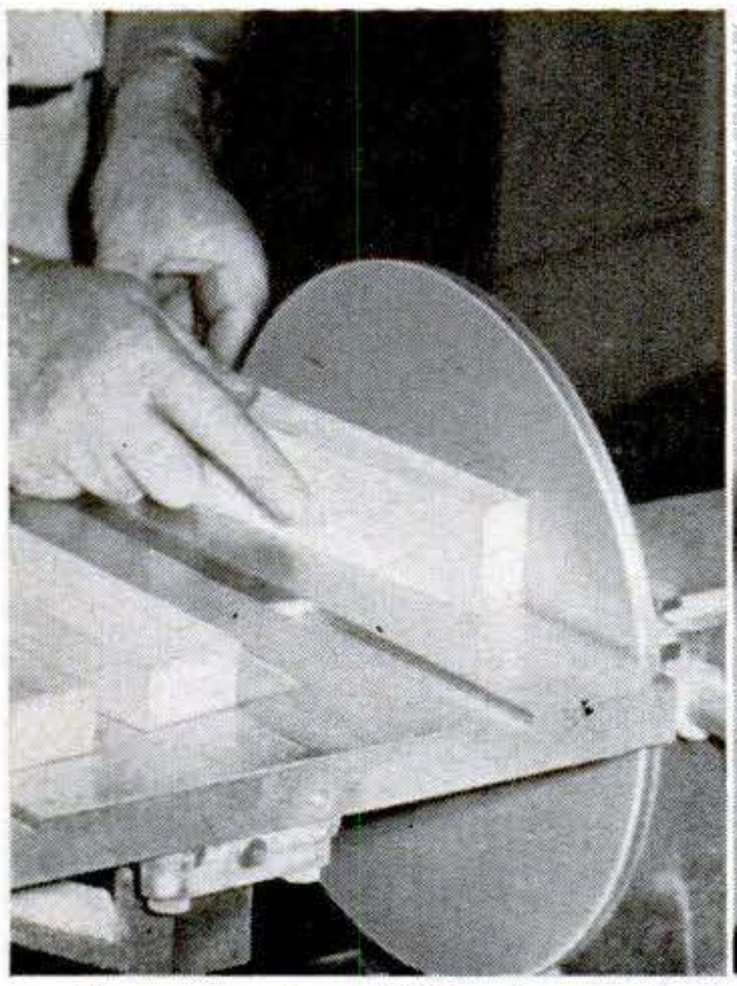
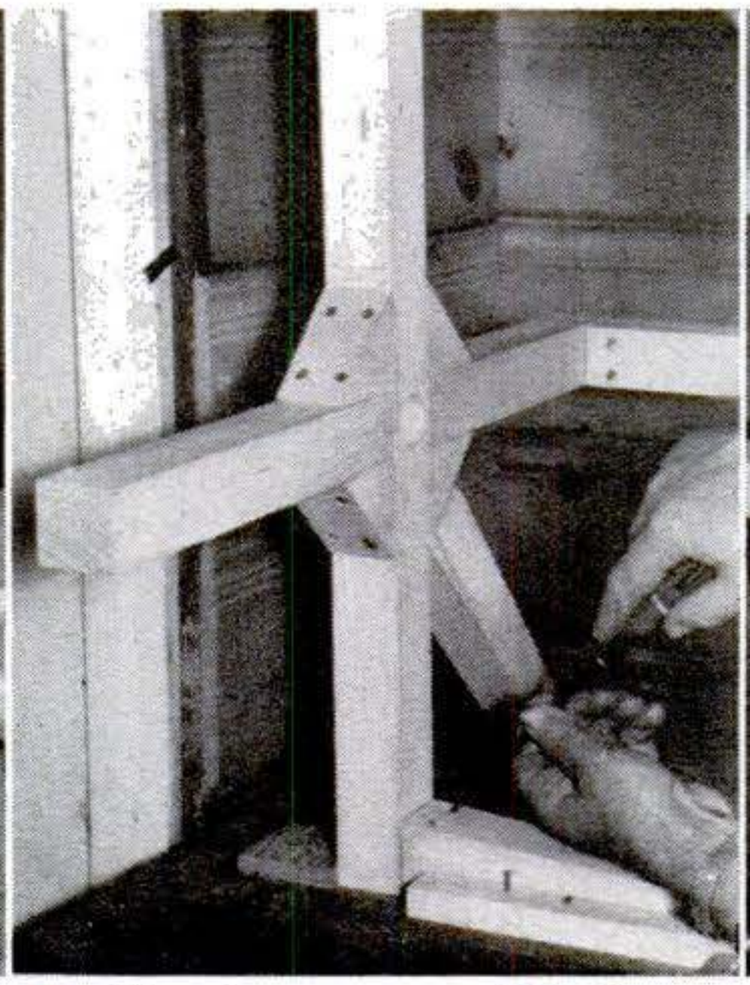


1 Seven pieces will form a solid base on which the top can revolve. Cut from nominal 2″ by 2″ ash stock, these pieces hint at the careful planning that always precedes the start of actual work on a project like this in the Shepherd shop. One piece is 24″ long, two are 11¼″. Sketch shows how to cut corner blocks.

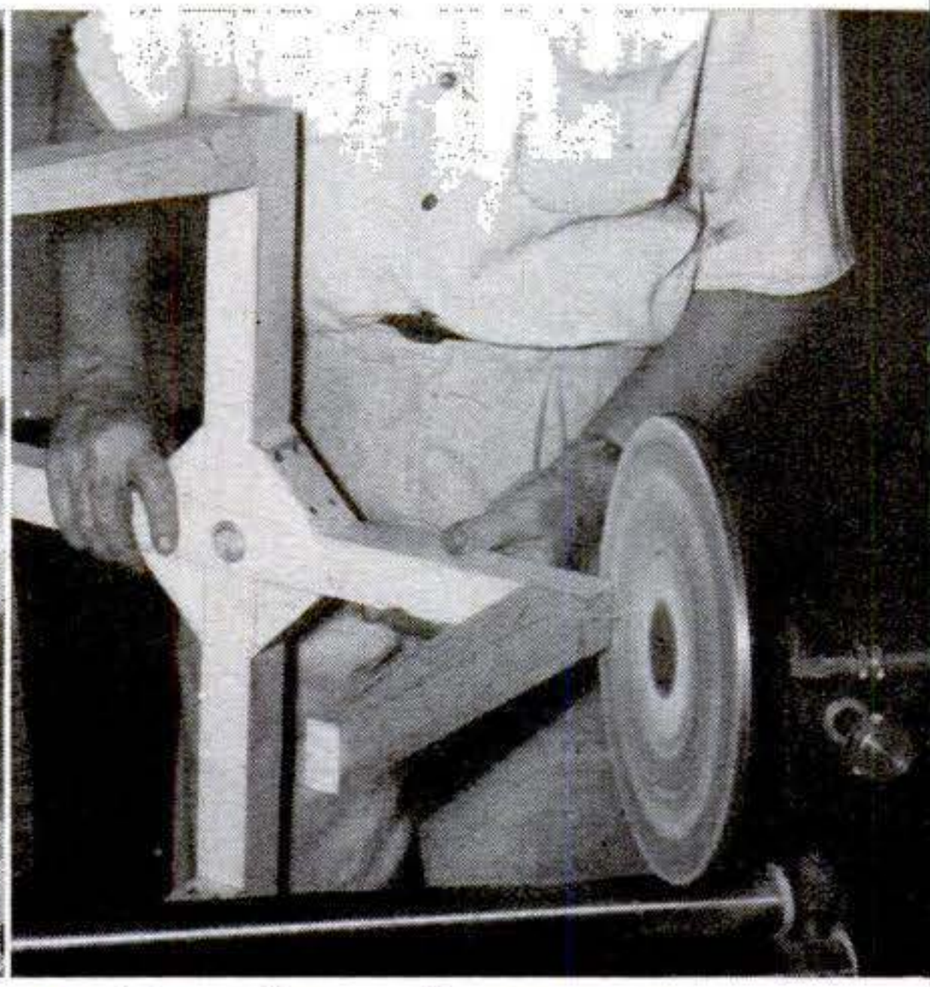
2 Scrap wood lines jaws of machinist's vise to keep 24″ stock from being marred while Shepherd bores pivot hole through center. Clamping 1⅝″ by 1⅝″ stock this way also will keep it from splitting while 1¼″ hole is being bored. Watcher at 90° angle can help keep bit straight while you bore.



5 Legs are four 12″ pieces of two-by-two, tapered to 1″ at the bottom. The taper is cut on the table saw and then smoothed off on the sander as above. Holes are then drilled for mounting the legs on the frame.



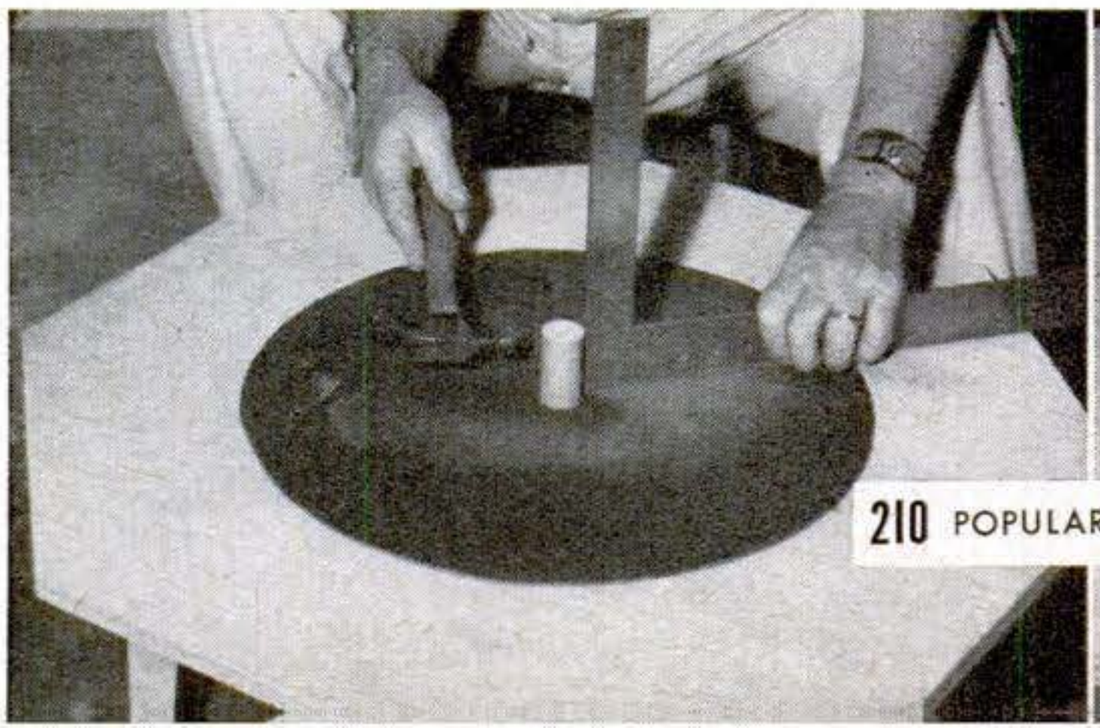
6 Slanting screws 1¾″ long attach legs underneath the horizontal part of the frame. Assembly is then reversed in jig and a 2¼″ screw run down into the top of each leg. Tapered faces of the legs go on the inside.

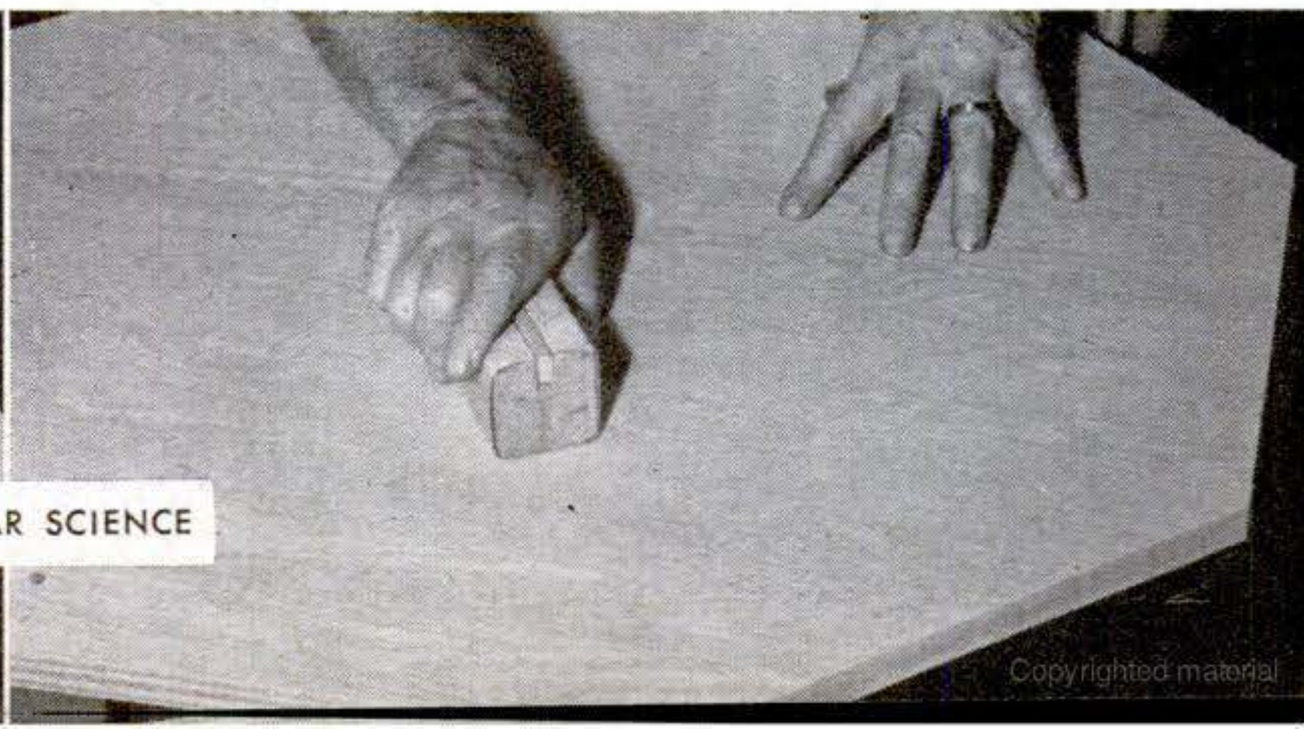


7 Rounding off upper corners of leg assembly to give the table a neat modern appearance is a quick job on disk sander. At the same time the glued joints are smoothed up and the rest of the wood is made ready for final finishing.

11 Second disk is nailed to underside of the top after dowel has been glued into the blind hole and squared up like this. Small brads also are driven into the dowel at sharp angle through upper surface of top. Third disk simply free-wheels between the other two.

12 Final sanding is done with very fine paper, No. 3/0. Notice the homemade sanding block, a piece of two-by-two with a key wedging the edges of paper into a groove. An assortment of sanding blocks like this is a handy addition to any shop.





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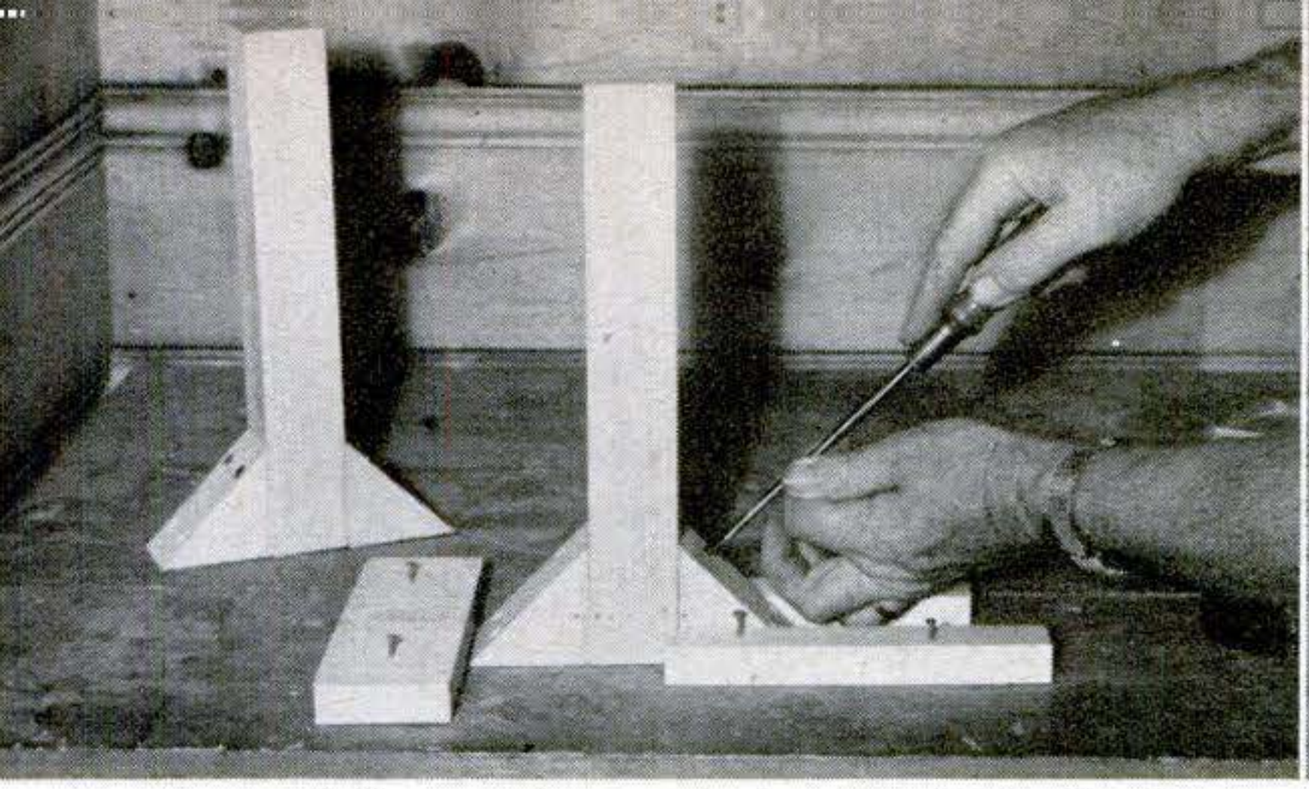
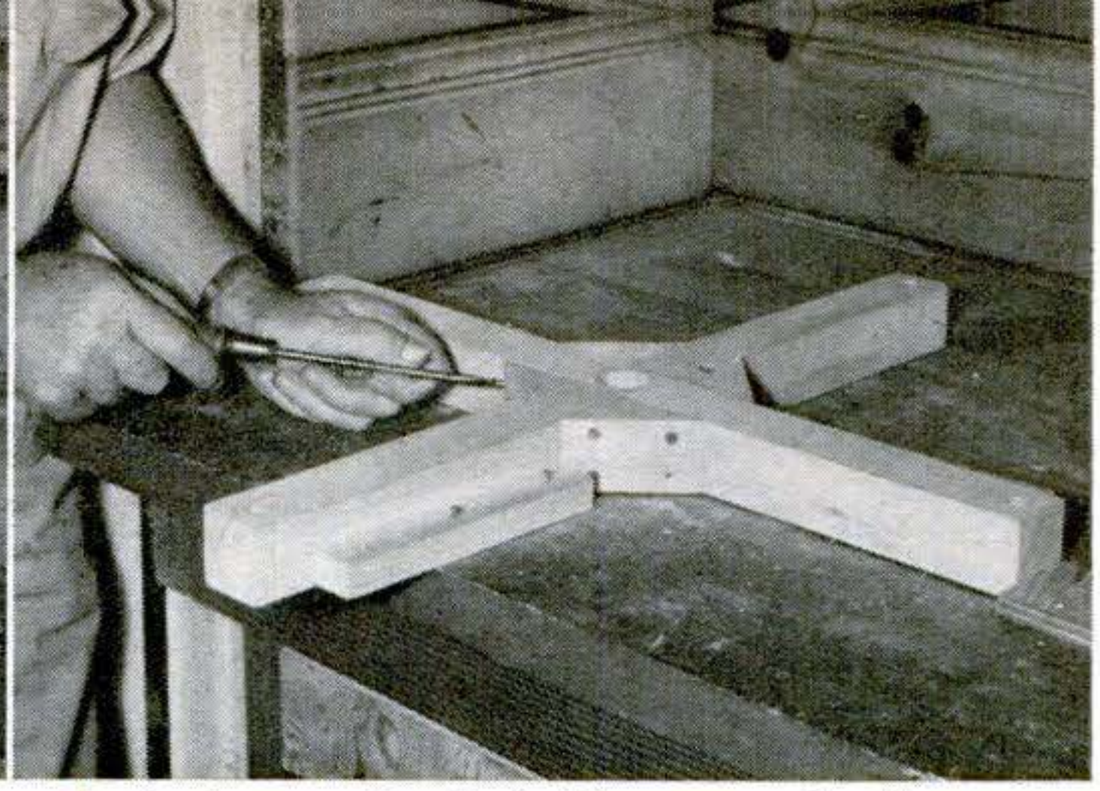
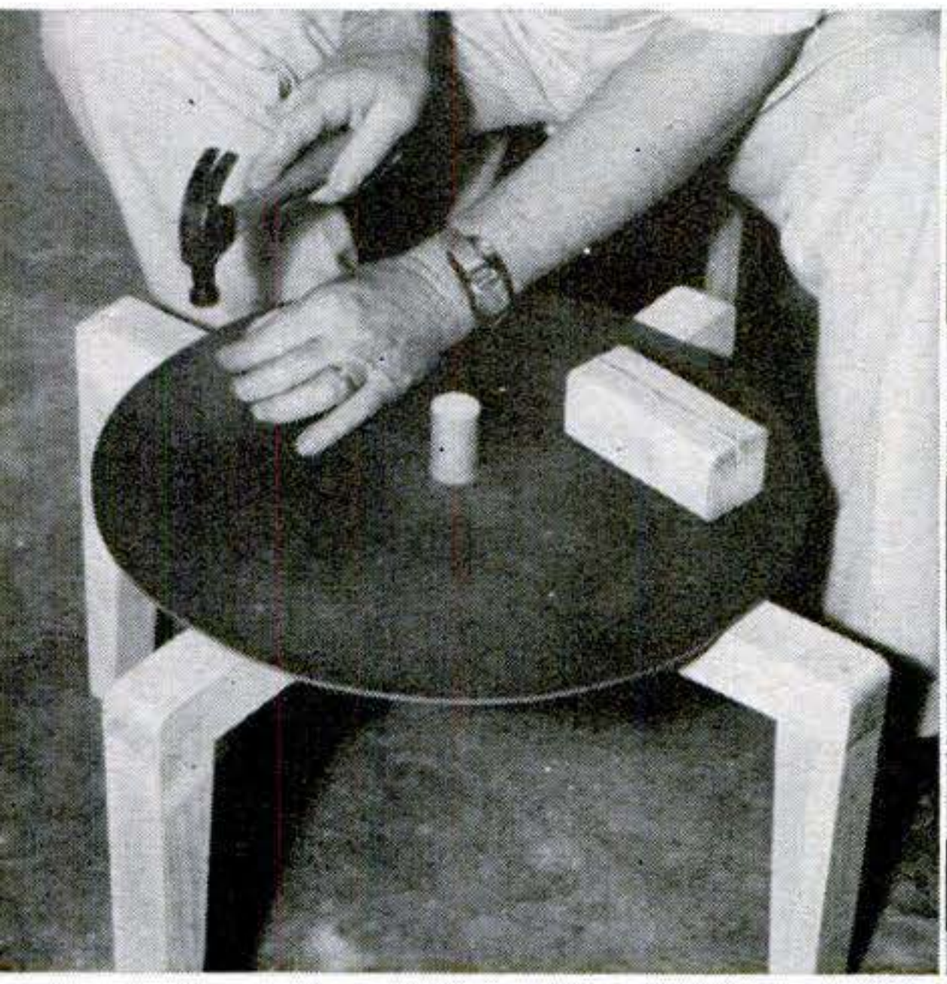


3 **A jig** equals an extra hand and Shepherd uses one every time he can. Here, his jig consists of blocks nailed to the bench top to hold the corner blocks while he fastens them flush with ends of the 11¼″ pieces. These will form two arms of the rigid part of the table top. One assembly already is complete.

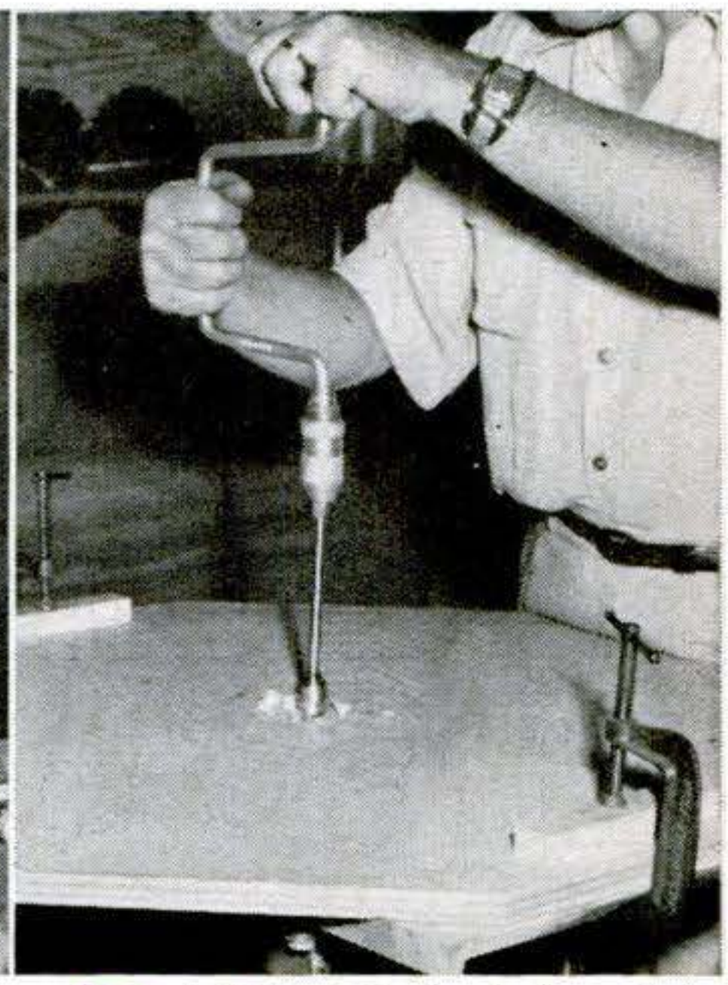


4 **And more jigs** help him screw the short arms to the center of the 24″ framing member. Glue is used between all joined surfaces. Jigs are changed in position to fit each operation. Holes for screws are made with drill press. Here the jig blocks hold the assembly firm while the worker turns in the screws.



8 **Three 18″ disks** are cut from hard-surfaced composition board (smooth on both sides) and 1¼″ holes are bored through the centers. With a 3¼″ length of 1¼″ dowel temporarily in place, one disk is nailed to top of leg assembly.

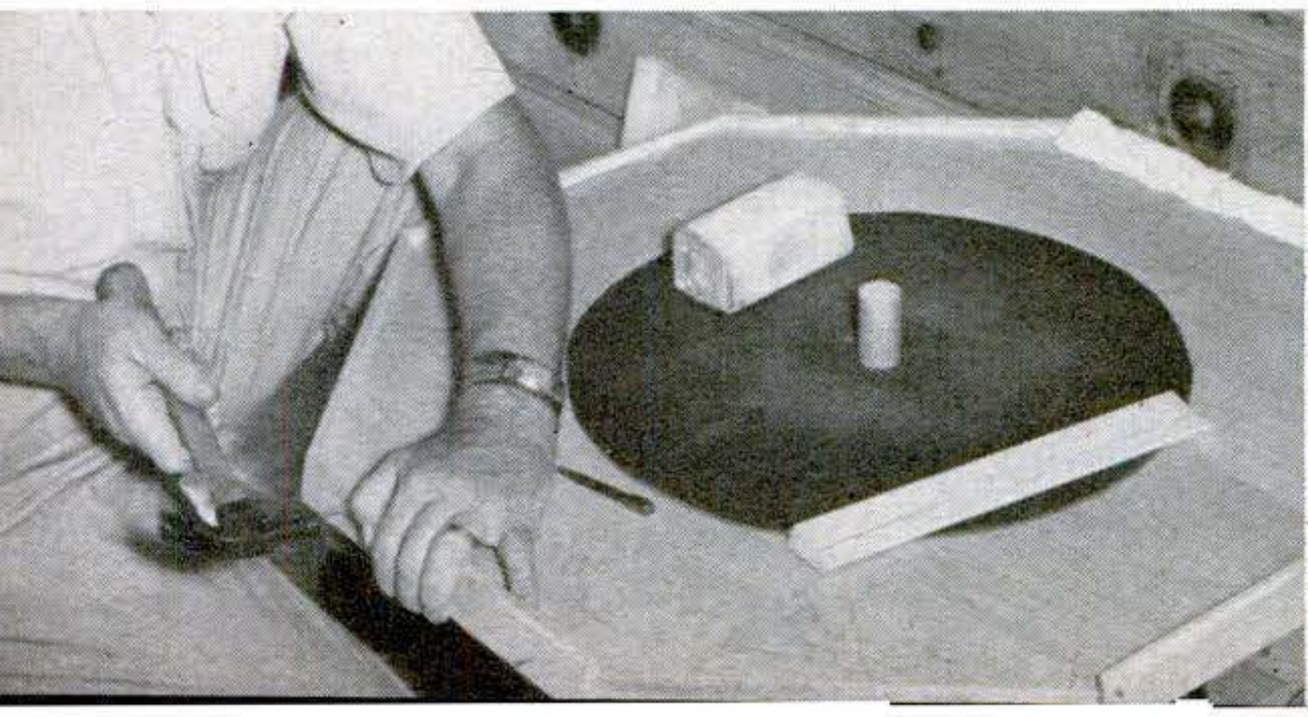
9 **Edges** of octagonal top each measure 12½″. Top, made from 30″ by 30″ piece of plywood, is laid out by marking off 8¾″ from each corner on edges, then connecting the points by ruling a line across each corner.

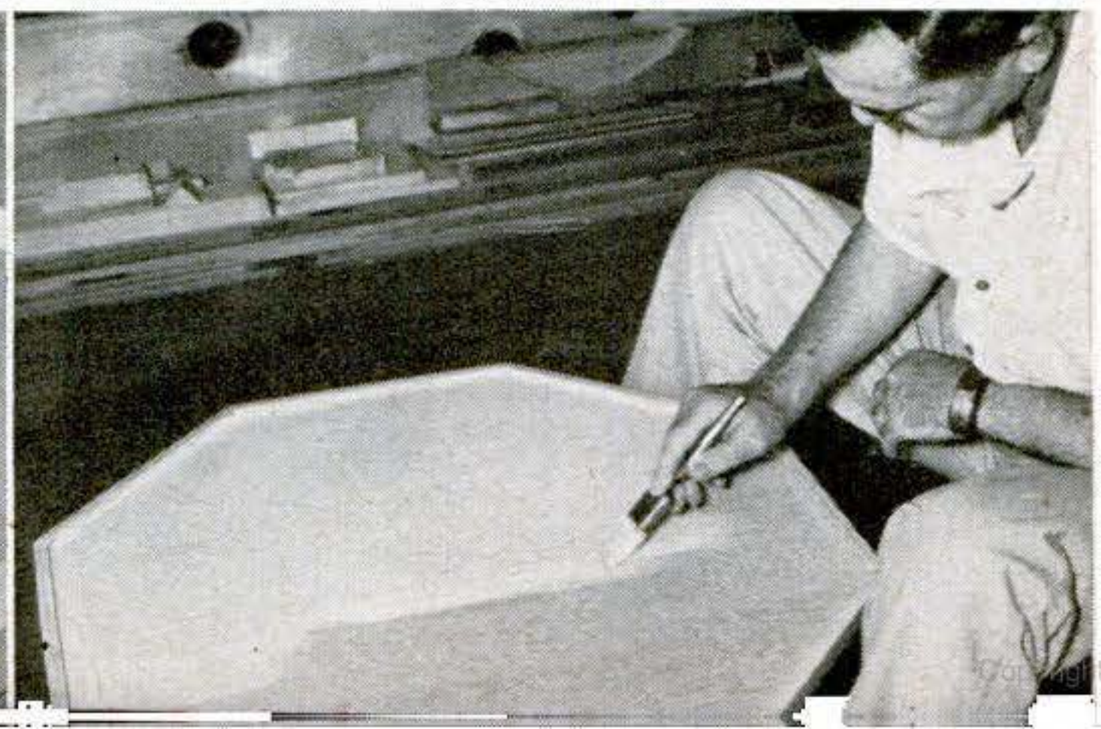


10 **A blind hole** is bored in center of top for 1¼″ pivot dowel. Center position is found by drawing lines from corner to corner across the piece. Hole is bored about ½″ deep. Note blocks to keep clamps from biting wood.

13 **Molding** now goes on, with the top upside-down on a smooth surface. The 1½″ molding, cut to 13″ lengths, is made to fit by sanding a 22½° miter on the ends. The pieces are attached with glue and finishing nails, which are countersunk and concealed with wood putty.

14 **Blond finish** is achieved by first smoothing out a coat of white filler. After this has dried about 10 minutes, it is rubbed off with a cloth, leaving a certain amount of the white. When filler is dry, white shellac and wax complete the finish.





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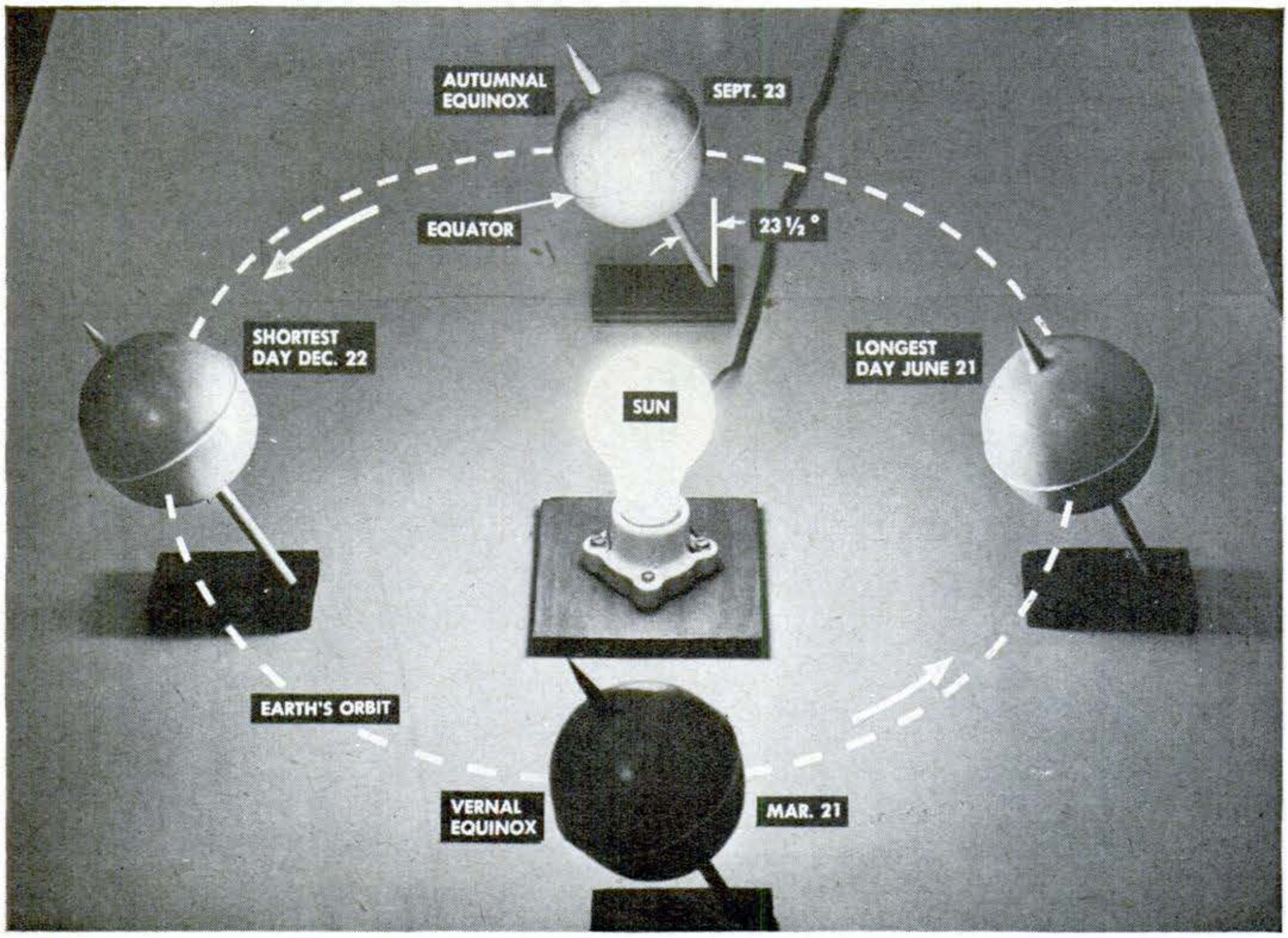
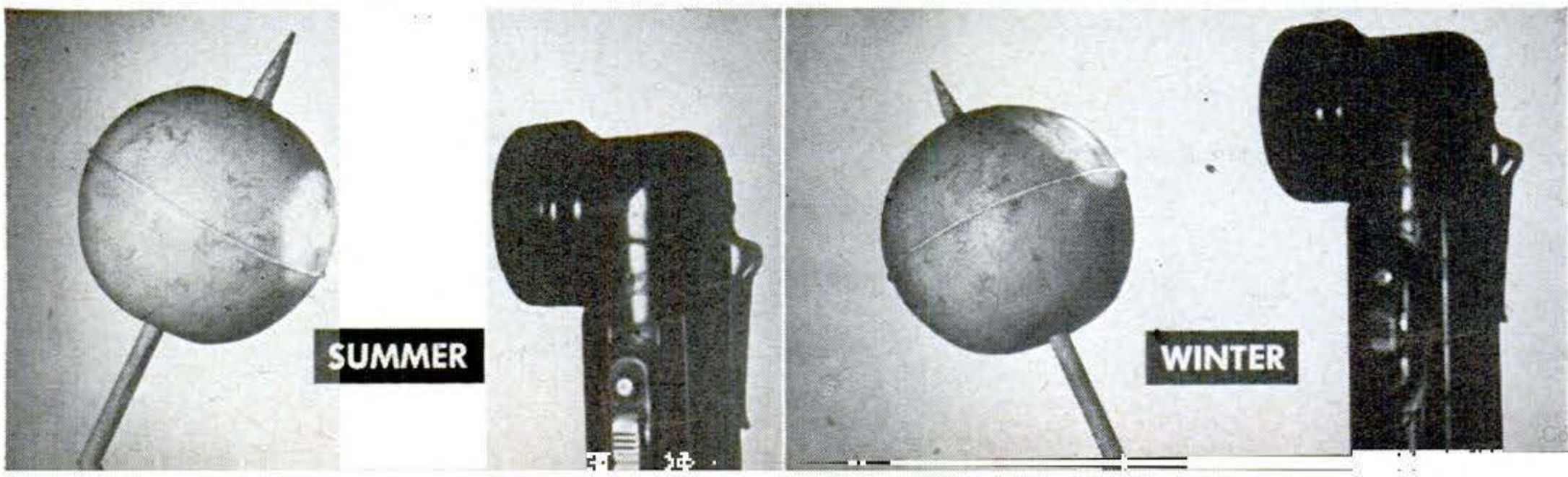
Why the Days Grow Longer

Approaching the vernal equinox in its yearly orbit, the earth is rolling again into the magic of spring. Ken Swezey's simple stunts will help you understand this and other solar facts.



Days are getting longer now because the earth is leaning toward the sun a little more each 24 hours. You can see this by maneuvering an orange on a stick (representing the earth) around a light bulb (representing the sun). Mount the stick so that it tilts 23½°, the tilt of the earth from a line perpendicular to the plane of its yearly travel around the sun. Tie a string around the middle of the orange at right angles to the stick to represent the equator. When the stick points toward the bulb, the area of light that strikes above the string is large and the days are long. This is summer. As the diagram shows, we now are approaching the vernal equinox. On the vernal equinox and the autumnal equinox, day and night on every part of the earth are of equal length. In the northern hemisphere, the longest day comes in June, the shortest in December. In the southern hemisphere, this timing is just reversed.

A tilted earth explains why it is warmer in summer than in winter. Lean the orange toward a flashlight held close to it, just as the northern hemisphere leans toward the sun in summer. You will see that the beam hits the area above the equator squarely, producing a concentrated disk of light. Direct rays from the sun, plus longer days, produce summer heat. Now lean the orange away from the light, as the northern hemisphere leans in winter, and raise the light so it again strikes above the string equator. You now see that slanting rays from the sun, combined with shorter days, account for winter cold. The southern hemisphere then has summer.



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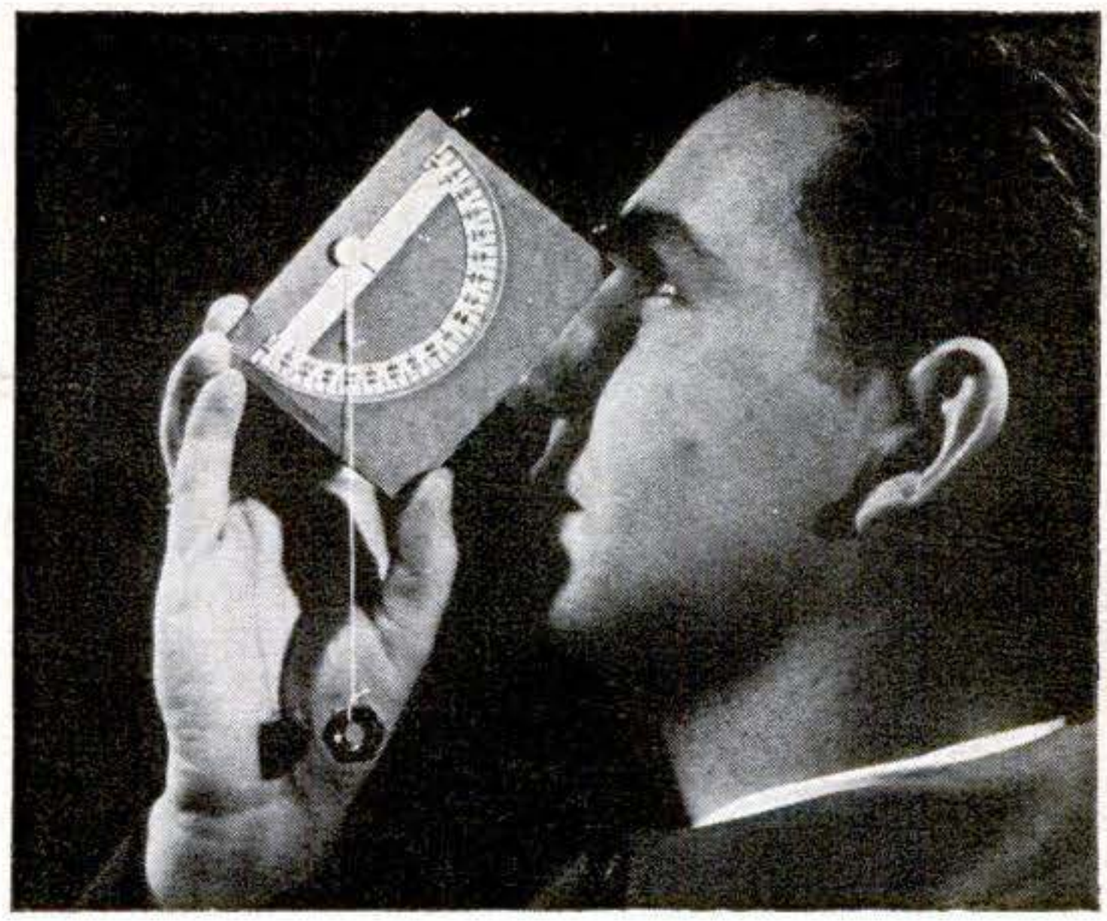
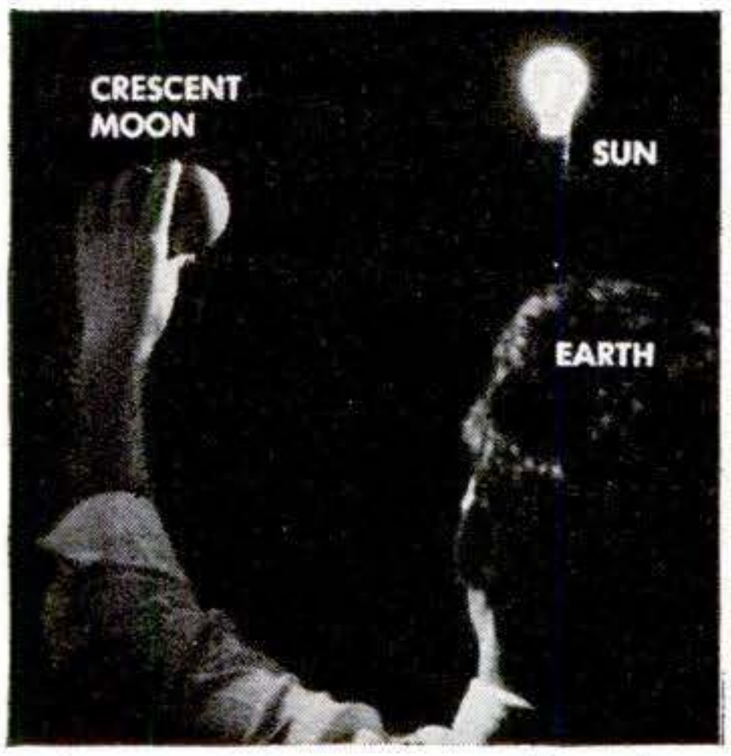
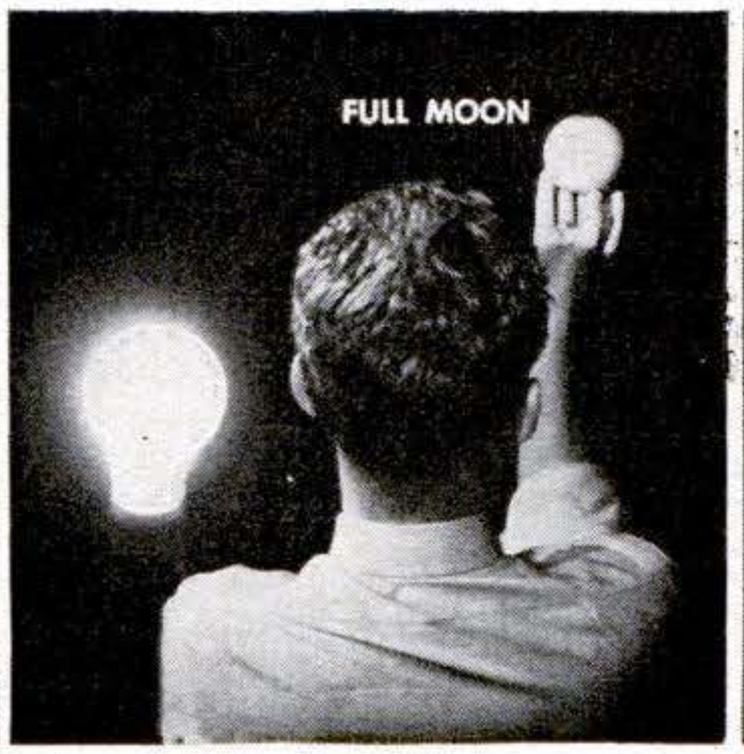
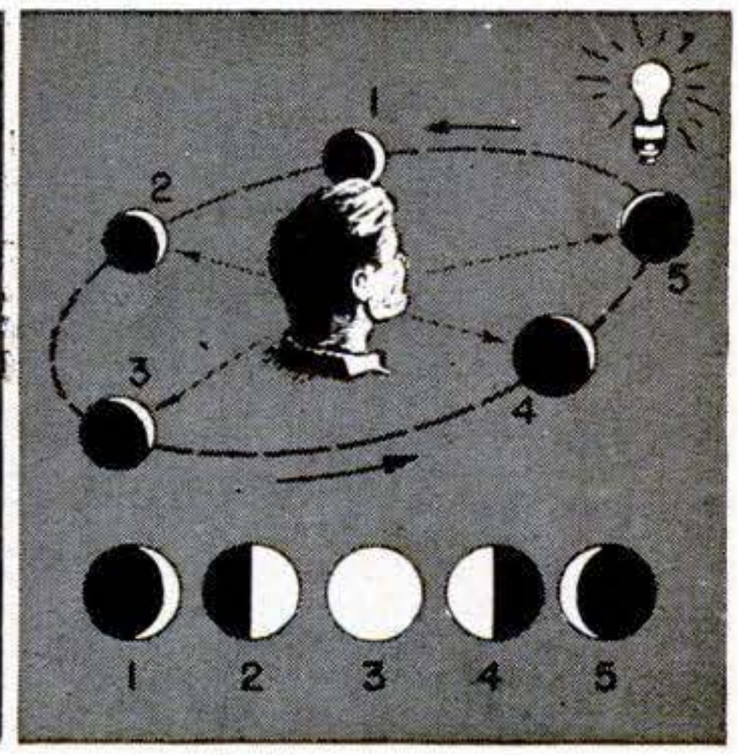
Finding your latitude. Latitude is merely your distance, measured in degrees of angle, north or south of the equator. You can find it with a crude quadrant assembled by gluing a dime-store protractor on a rectangle of cardboard. Align the straight edge of the protractor with the long edge of the cardboard sheet. Suspend a weight on a string pivoted to a thumbtack at the center. Run two small screw eyes into the top of the board to serve as sights.

On a clear night, sight through the screw eyes at the North Star. When the star is aligned, hold the thread against the protractor and observe where it crosses the scale. This number represents the angle the North Star makes with the horizon. Since the angle of this star at the equator would be almost zero and at the North Pole 90°, it can be seen that this number also represents the latitude of the observer.





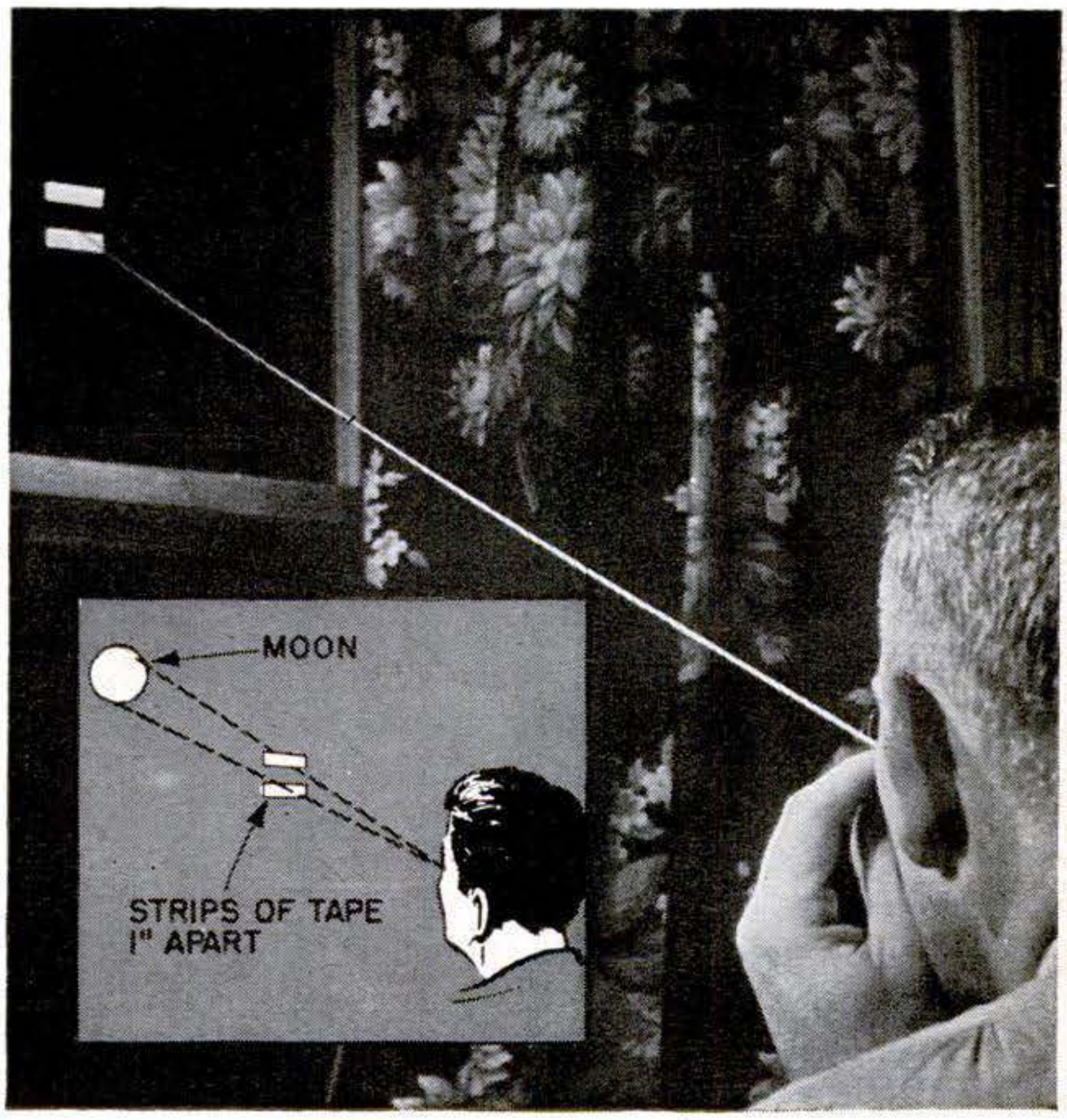




Phases of the moon will no longer be a mystery once you have duplicated them with an orange and light bulb. This time, let the orange represent the moon, your head the earth, and the bulb the sun. Turn counterclockwise so the orange goes around your head with the light stationary and you'll see all stages of the moon as indicated in the sketch above.

How to measure the moon. At about the time of the full moon (Feb. 28 and Mar. 30), fasten two strips of adhesive tape exactly 1″ apart on a window pane through which the moon is visible. Under the lower strip anchor one end of a long string. Then, holding the other end of the string, sight the moon between the tapes, moving backward or forward until the moon precisely fills the space between the tapes. At this point, pull the string tight and mark it where it touches your eye. Then measure the distance from the tapes to the marked spot.

Although the moon is about 239,000 miles away, you can now determine its diameter by a simple calculation. The moon diameter bears the same proportion to its distance to the earth as the distance between the tapes bears to the distance to your eye. If your eye is, say, 110.5″ from the tapes (110.5 times the distance between them), then the diameter of the moon is 239,000 miles divided by 110.5. This turns out to be 2,167 miles, which is quite close. Astronomers usually list the diameter of the moon as 2,160. END



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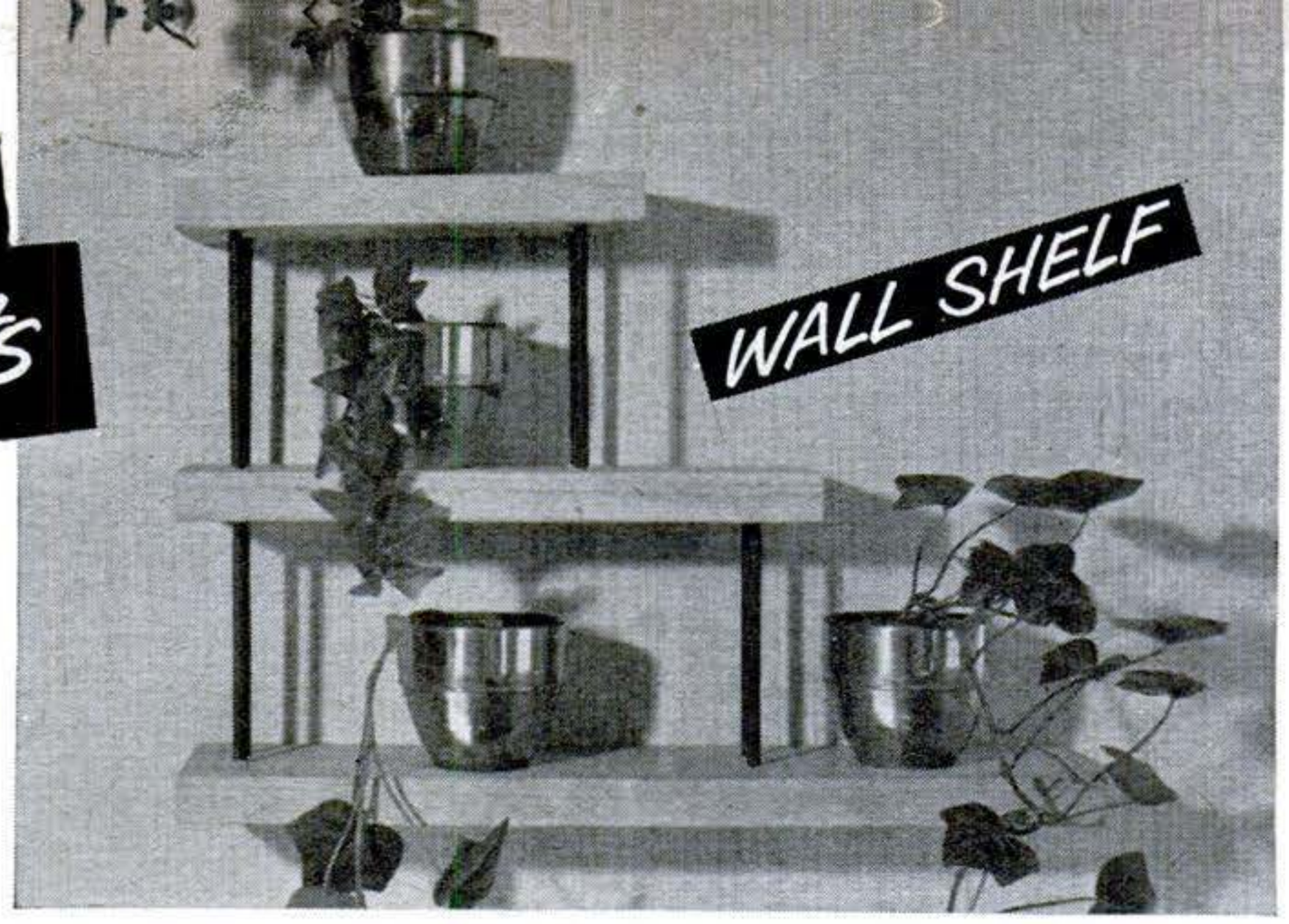
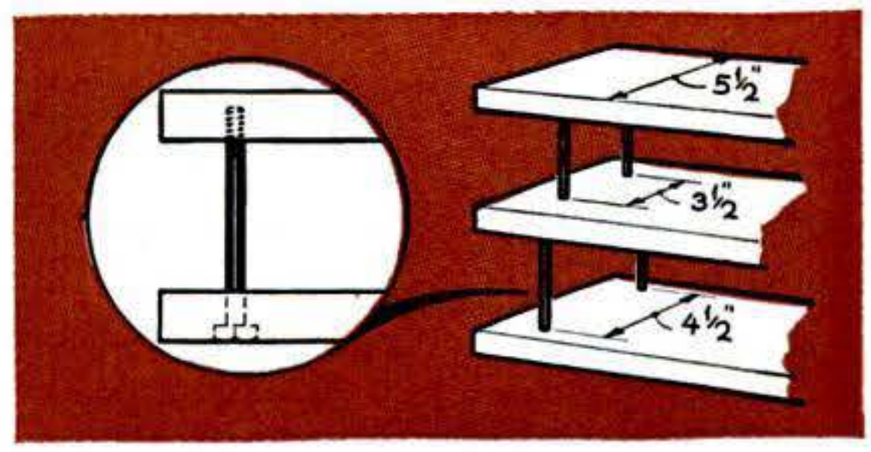
One Evening Shop Projects

The humble bolt turns scrap-box lumber into fancy furnishings for your home.



Pots of ivy look fine on this triple shelf. It is made of three pieces of ¾″ oak 5½″ wide arranged in step fashion. Eight ¼″ bolts 6″ long hold the shelves together. The holes were all bored slightly less than ¼″ so that the bolts would be a tight fit. The holes were countersunk under the two longer shelves to take the bolt heads. Make the shelves any length.



A decorative tile resting on this small stand serves as a hot plate for a tea party. It consists of a wood base sawed to the size of the tile, and four ¼″ by 6″ bolts screwed into each of the four corners at a 60° angle. Use a drill a bit less in diameter than the bolt to insure a tight fit. A drill press will simplify such angle drilling. If you must use a brace or hand drill, first make a guide hole at the proper angle in a block of wood and use this block as a jig by clamping it on the wood to be drilled. Screw all bolts into the holes the same distance to level the tile.

Charles and Marion Schroeder of Mundelein, Ill., saw beauty in a strictly utilitarian hunk of hardware—a bolt. As their handsome projects here prove, they were right. The black-painted bolts make a striking contrast to the natural-finished hardwood parts.

Carriage and machine bolts are available at large hardware stores in diameters up to ⅝″ and lengths to 20″. They are simply threaded or press-fitted into holes drilled in the wood. Make test holes in scrap to be sure you are using the best drill.

For digest-size publications, use ¼″ by 6″ bolts placed at 70° angles along two sides of a piece of hardwood. This makes a table rack; for a floor rack for large magazines, use ½″ by 16″ or even larger bolts in a base about 1 5/16″ thick. Be careful to drill all holes at the same angle; a simple jig will make sure they are right.

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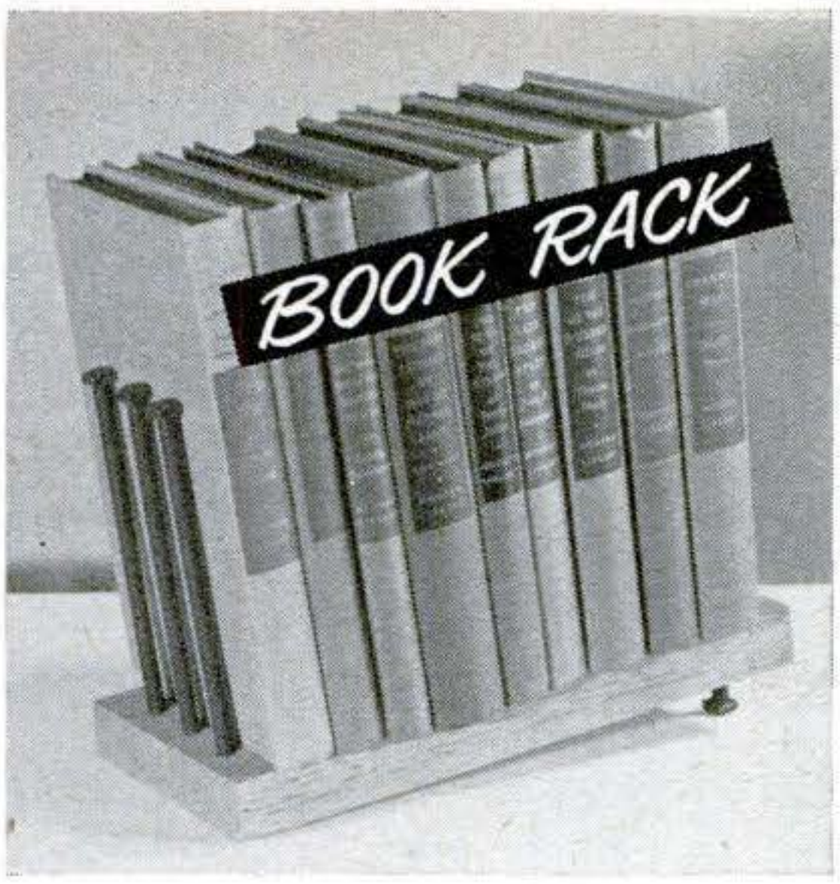
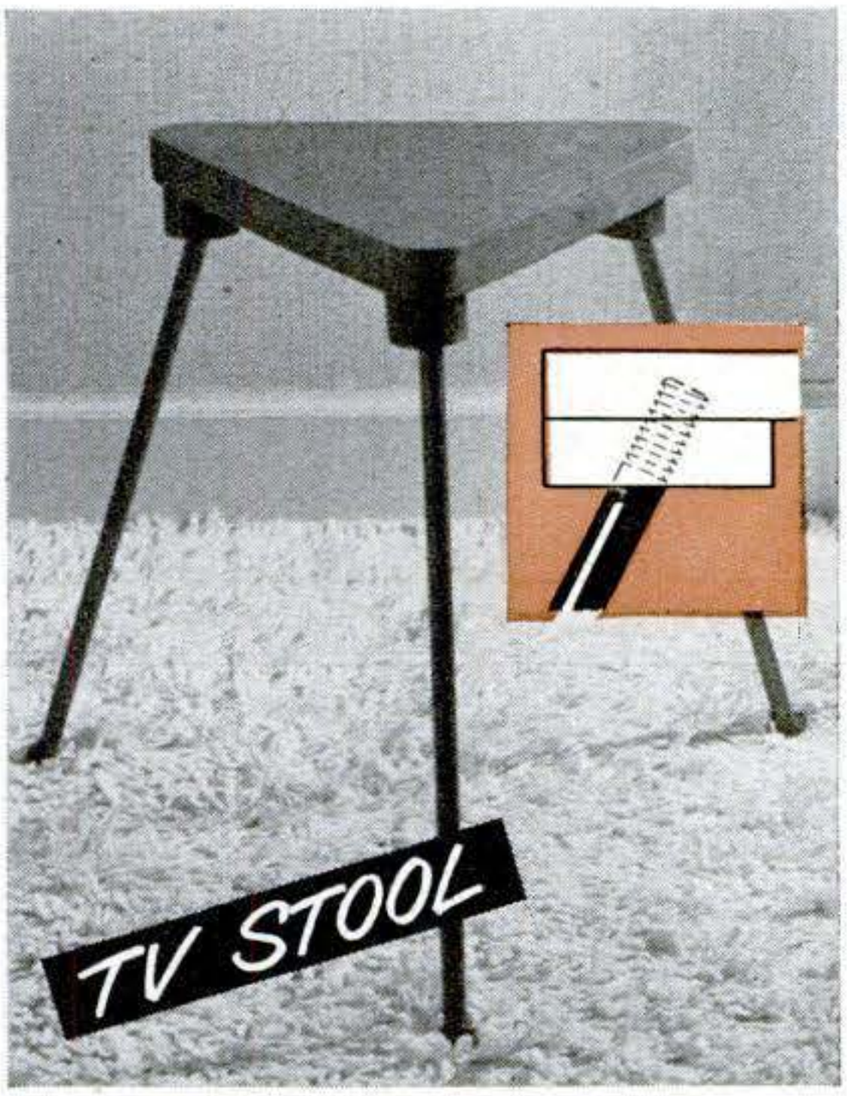
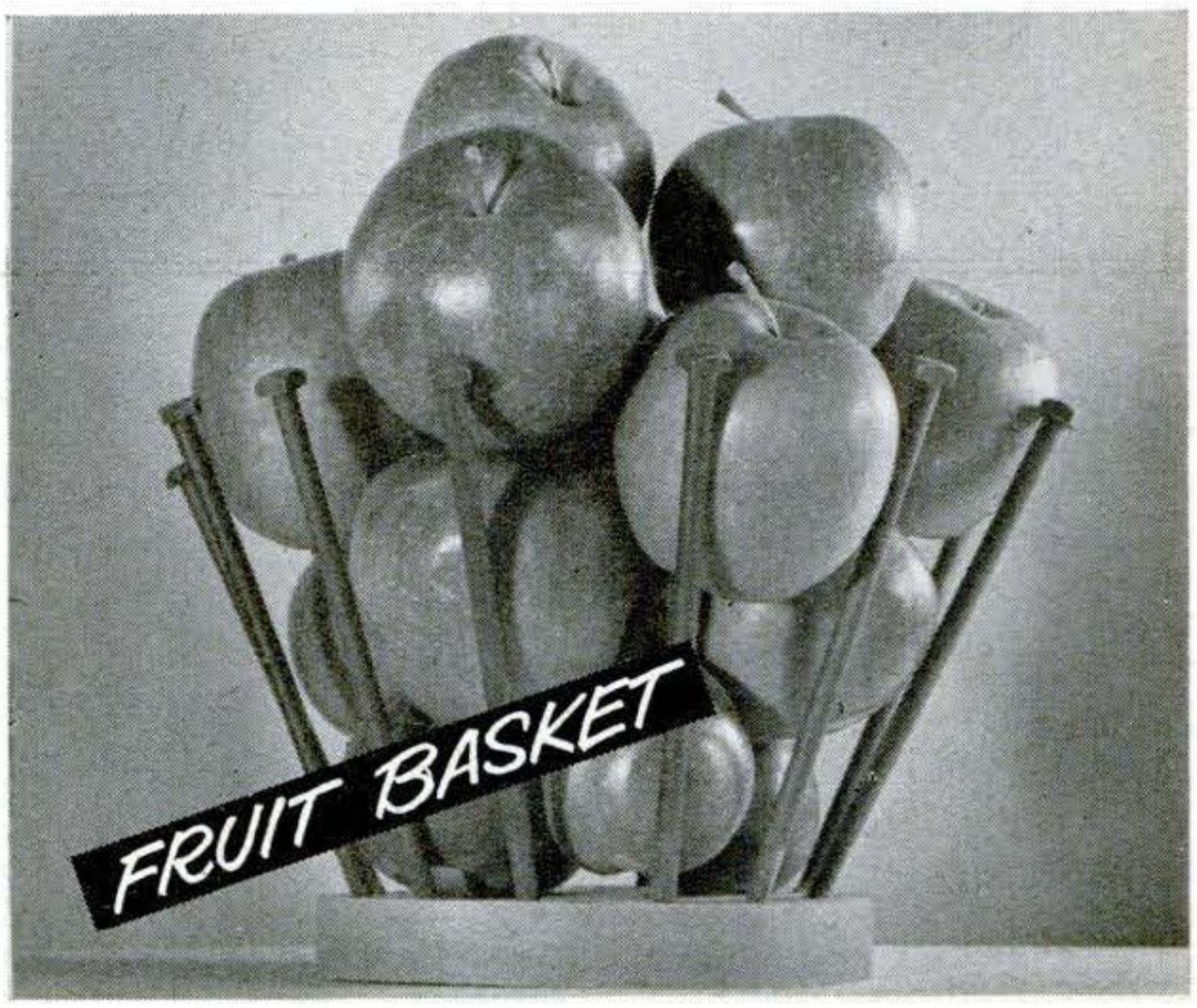


A simple book rack that you can complete in a few minutes is shown here. Drill three ¼″ holes ½″ in from each end of a piece of hardwood ¾″ by 5½″ by 12″, spacing them evenly between the sides. Turn three ¼″ by 6″ bolts into the holes at one end. Turn three ¼″ by 1½″ bolts into the holes at the other end—from the opposite side of the board—to serve as legs for the rack. That's it.

Candle holder. The materials necessary for making the holder are a 5″ disk of ¾″ stock and three 1½″ disks of ¼″ stock, plus three ¼″ by 3″ machine bolts. Scribe a 3″ circle in the center of the large disk. At three equidistant points along its circumference drill three ¼″ holes at angles of 60°. Counterbore the holes underneath the disk to take the bolt heads. Run the bolts through and turn them into holes drilled in the small disks. Two screws anchor each candle.



A light seat next to the TV set makes it more comfortable to twiddle the controls. Here it is—a 12″ equilateral triangle cut from 1″ stock with angled legs of ½″ by 16″ carriage bolts. Screw the legs into holes drilled at 60° angles into the two thicknesses of wood at the corners. Glue the corner blocks into place under the top.



Modern apple basket. Take a 6″ disk sawed from ¾″ stock, bore a dozen ¼″ holes around the edge at an outward angle of 70°, turn in a dozen ¼″ by 6″ bolts, and you've got it.

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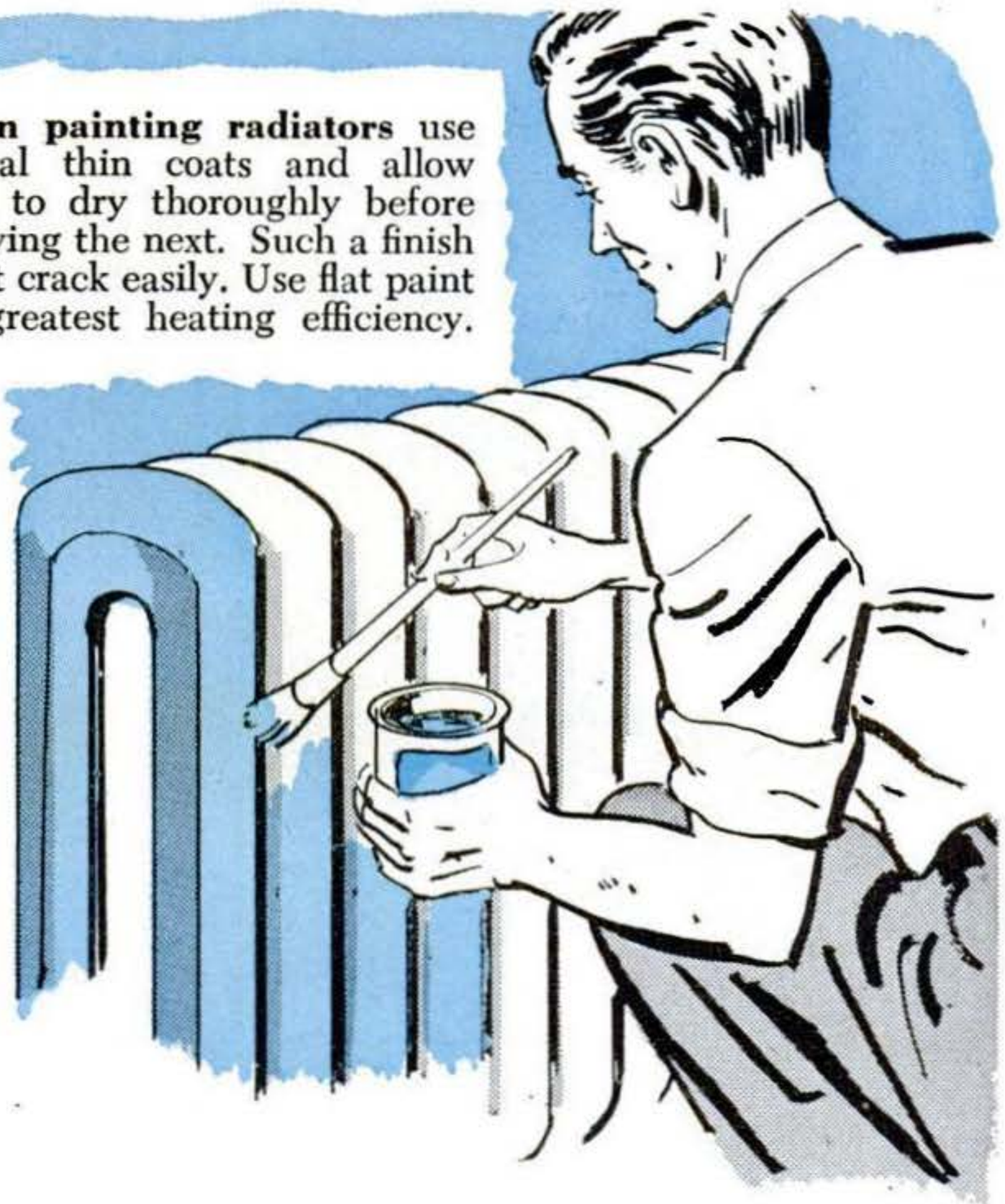
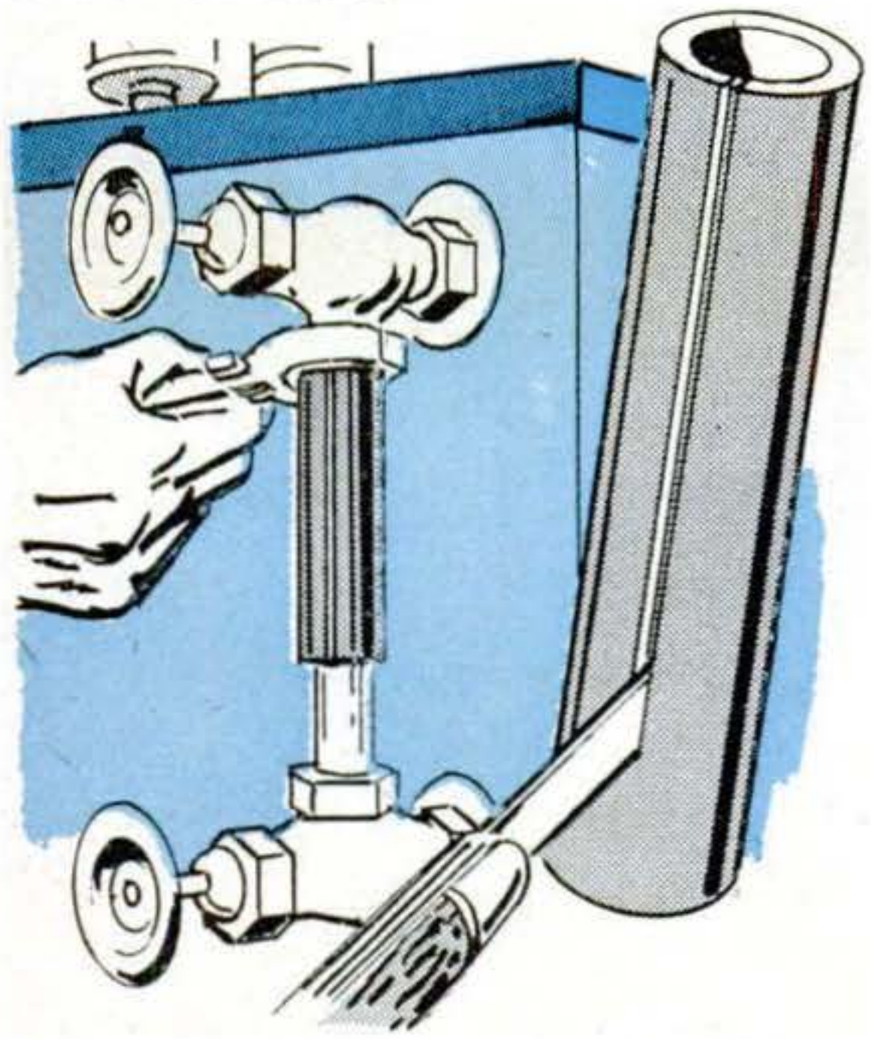
KEEPING THE *Home* SHIPSHAPE

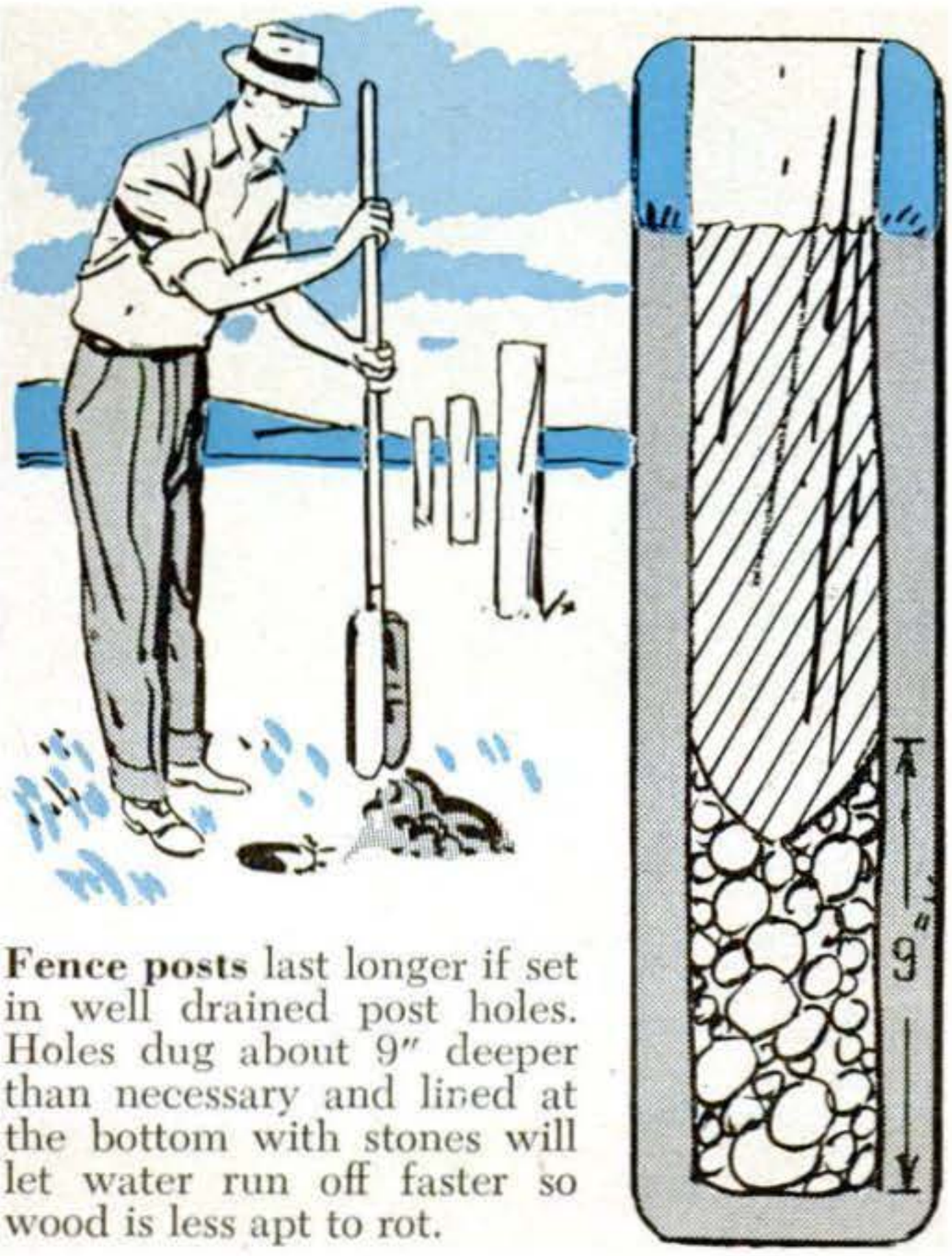


When painting radiators use several thin coats and allow each to dry thoroughly before applying the next. Such a finish won't crack easily. Use flat paint for greatest heating efficiency.



Protect a gauge glass from breakage when doing a replacement job. Cover the end where the wrench is applied with a slit length of rubber hose to cushion it if the tool slips.

Gravel walks or driveways will stay free of grass and weeds longer if they are laid over a base of coarse rock salt.



Fence posts last longer if set in well drained post holes. Holes dug about 9" deeper than necessary and lined at the bottom with stones will let water run off faster so wood is less apt to rot.

To protect wallpaper while you paint the woodwork, use a yardstick as a shield. A screen-door handle screwed to the stick makes it easier to hold and keeps paint off hands.

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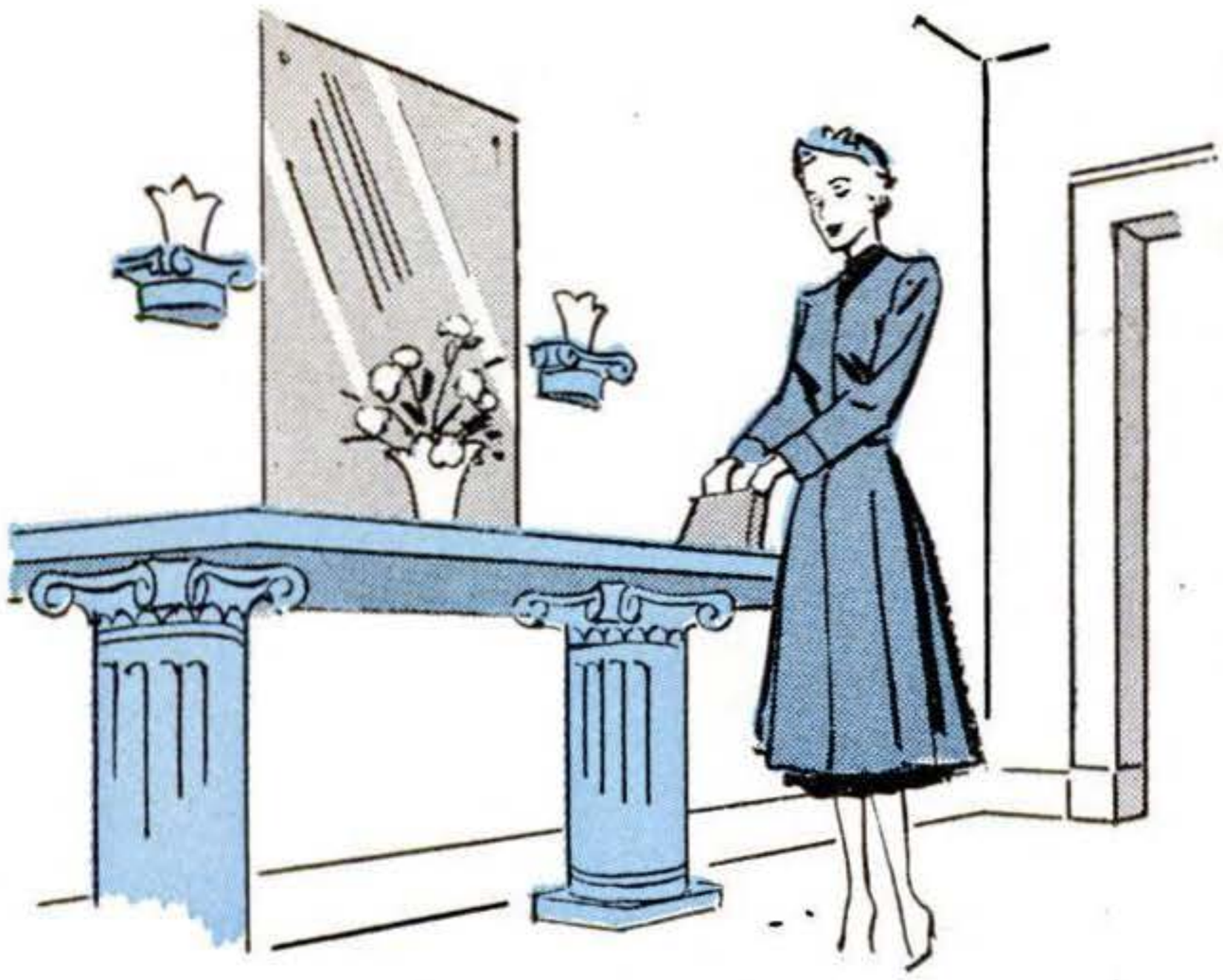
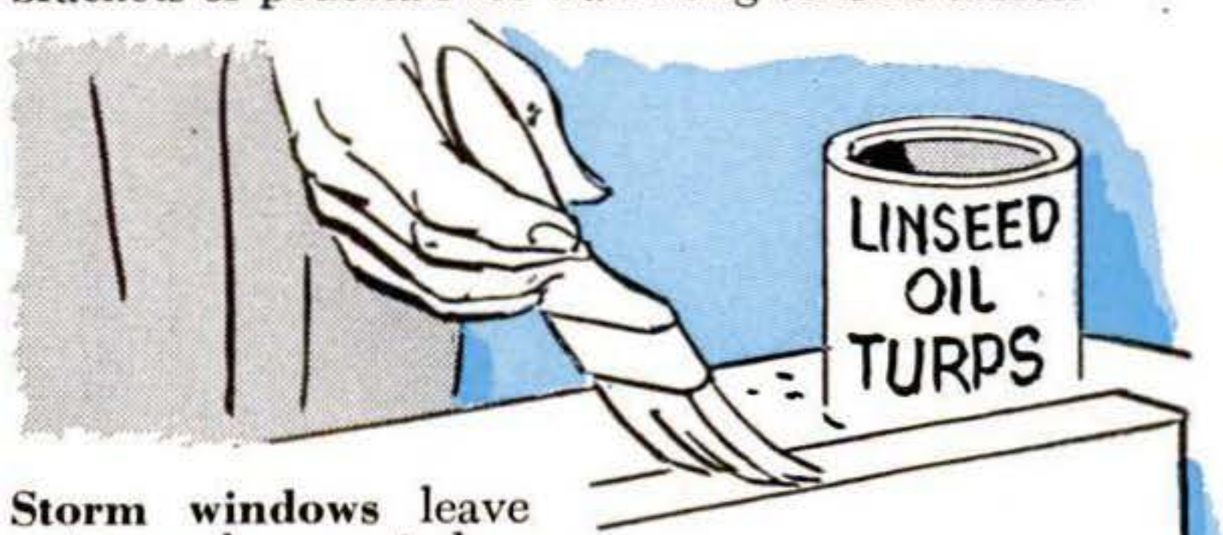


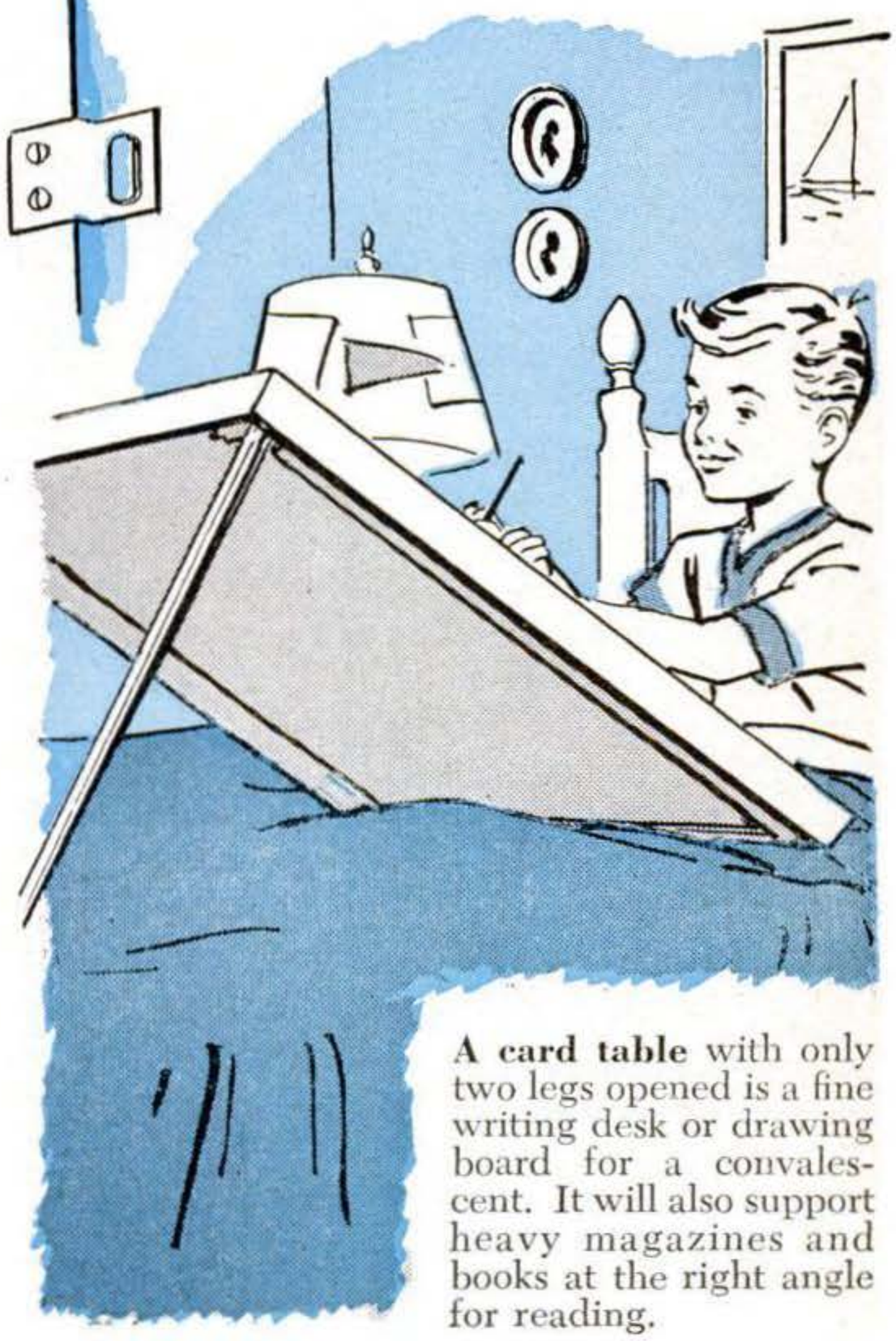
Save those old porch pillars and ornate balustrades. Cut down, they make handsome table pedestals and lamp bases. Split down the middle, they form wall brackets or pedestals for wall-hung console tables.

The spring cleanup goes faster if you have a metal snow shovel handy. Its broad surface will lift quite a pile of debris with one scoop.



Storm windows leave paint marks on window frames? Before storing them, sand to the bare wood where they hit frame and coat with two parts boiled linseed oil, one part turpentine. Repeat in the fall.

A lower closet rod will bring clothes down within a child's reach. Two wire hangers straightened and inserted through holes in a piece of broomstick will do the trick.



A card table with only two legs opened is a fine writing desk or drawing board for a convalescent. It will also support heavy magazines and books at the right angle for reading.

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Motor-Driven Cruiser Built from Tin Cans

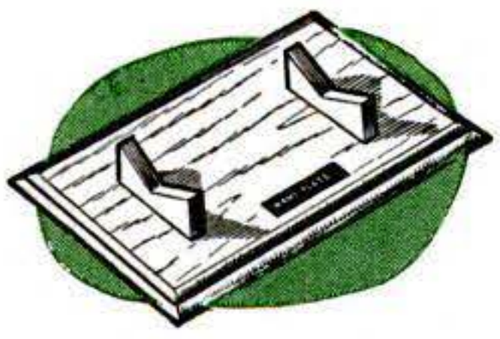
You don't have to be a sheet-metal expert to fabricate this trim craft of tin plate salvaged from oil and antifreeze cans. You just cut the sections from patterns and solder them together.

By Gus W. Hall

THE lowly tin can, regarded by most craftsmen as good for goats and nothing else, is just about all the material you need to build this slick model cabin cruiser. The smooth lines of the boat prove at a glance that tin cans can be as valuable in the workshop as they are in a supermarket.

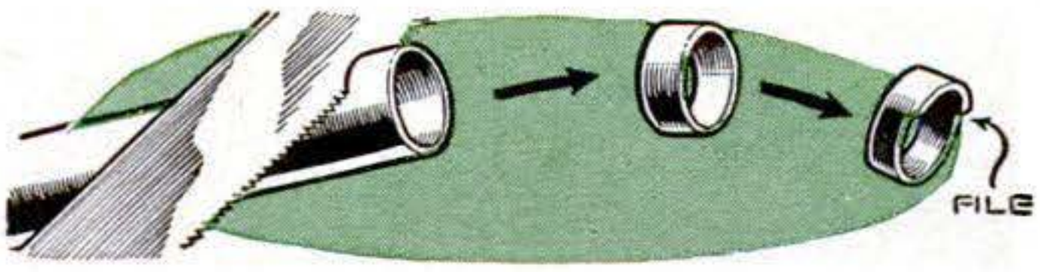
Hull. Cut out the four main parts and assemble the hull as shown in the photos, using drops of solder spaced at 1½″ intervals. When completely fitted and spot-soldered, lay a continuous bead of solder along all the seams to make the hull watertight.

Cradle. Before you complete the boat, it's a good idea to make a stand to support it. The cradle above was built up of ⅜″ and ⅛″ brass tubing, using the hull to determine the shape of the cross members. A hardwood cradle, like the one at left, may be easier to make and is equally impressive if finished nicely.



Decks and coamings. Solder the forward deck to the hull after cutting out the hatch opening, then add the side and rear decks and coamings. Note that the side decks and coamings are cut from the same pattern, but bent in opposite directions to produce the port and starboard sides. The lower frame of the windshield is actually part of the continuous coaming, so solder it across the forward deck and file all edges even.

Porthole frames. Cut these from ½″ outside-diameter brass tubing, and file the lower half of each frame to form a drip guard. Smooth the outer edges with fine



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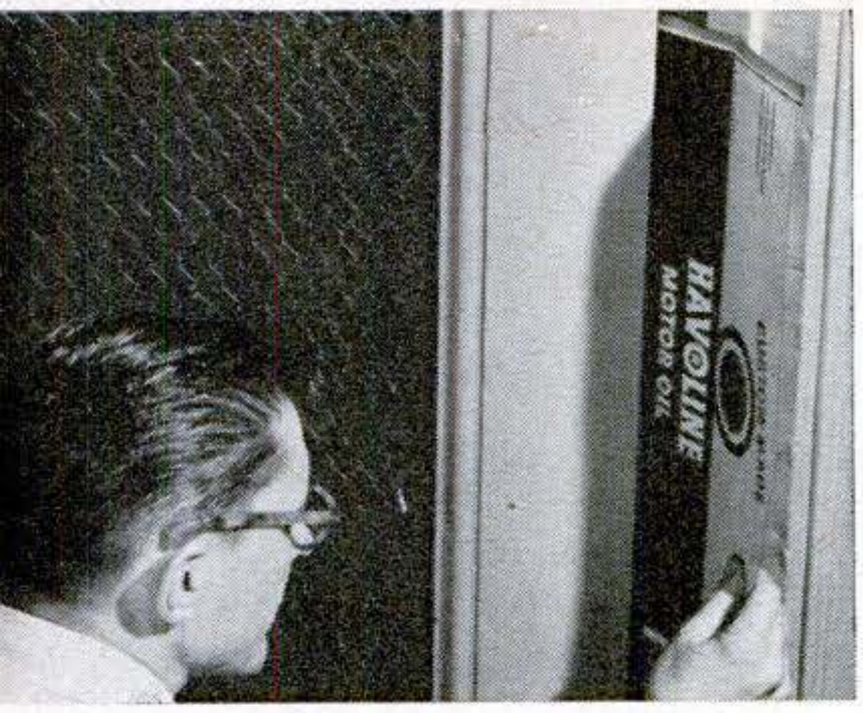
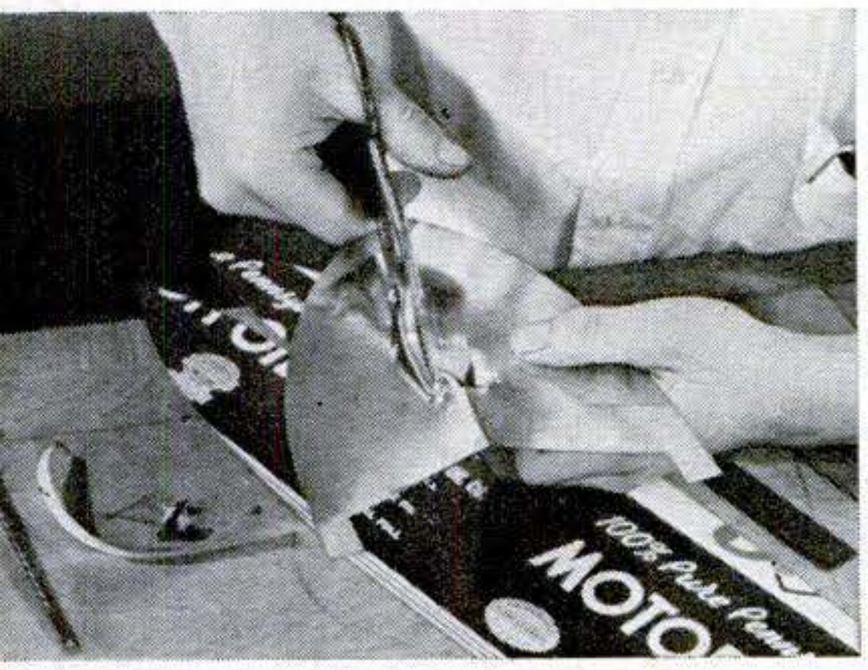
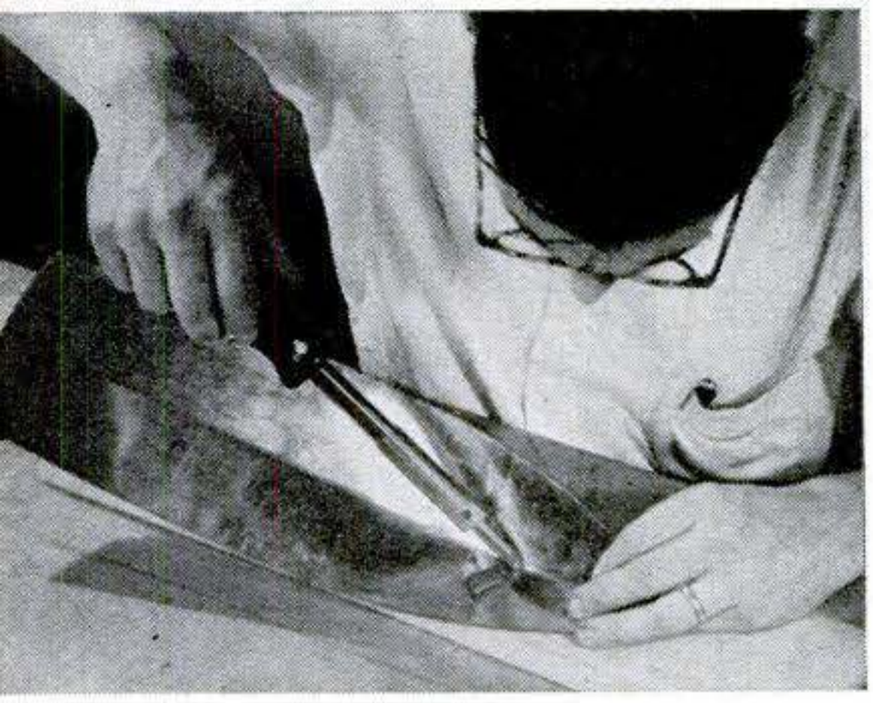


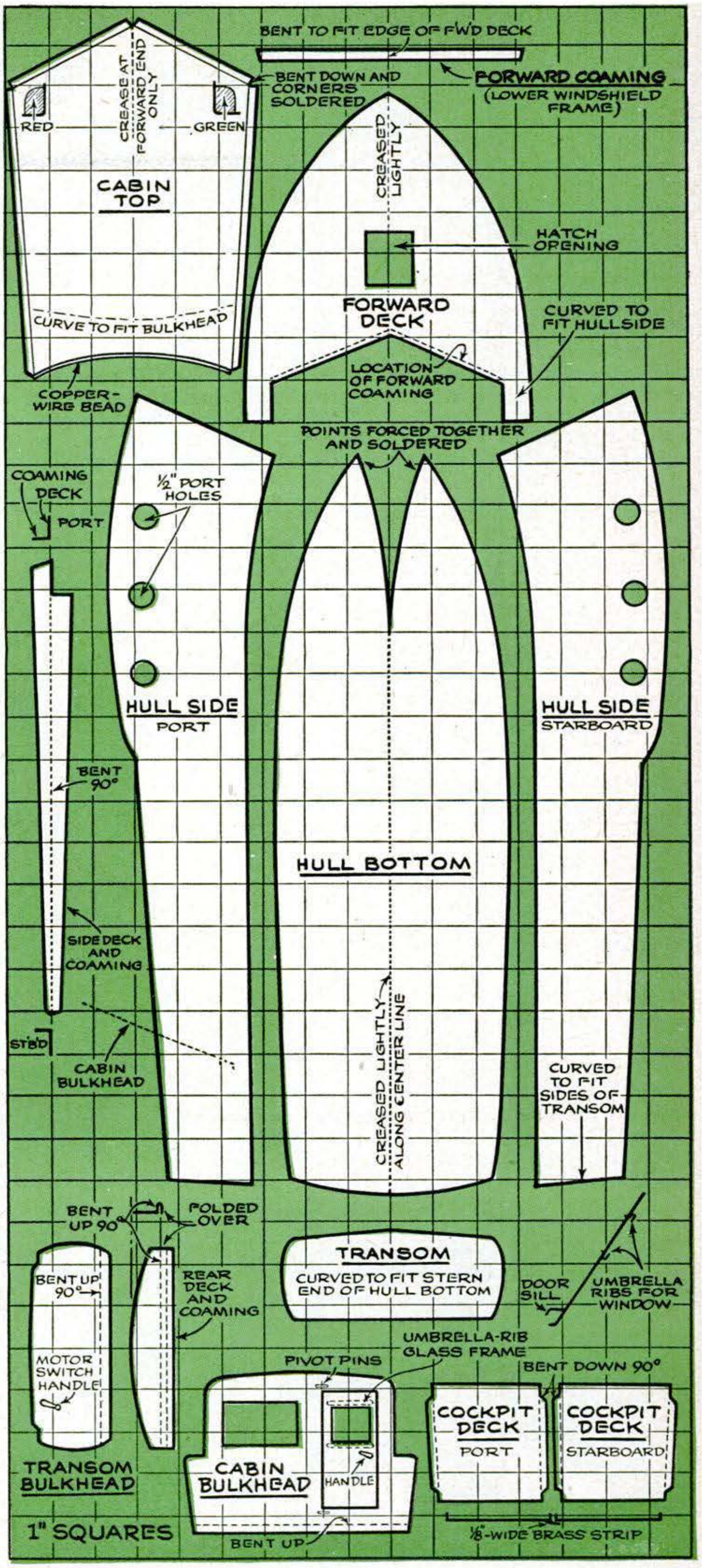
DOOR IS BENDING BRAKE to put sharp, straight crease in tin for hull bottom. Paper template is then pasted on, aligning centerline with crease. Sheet of tin shown was salvaged from round five-quart oilcan.



TIN SNIPS are most important shaping tool; good soldering iron is also needed. Hatch opening is started by driving large nail through tin and gradually working snips around until cut is completed.



HULL BOTTOM is formed by bringing two bow points together and tacking them with drops of solder spaced about 1½" apart. Fine sandpaper is used to clean lacquer, lining or paint off meeting edges.



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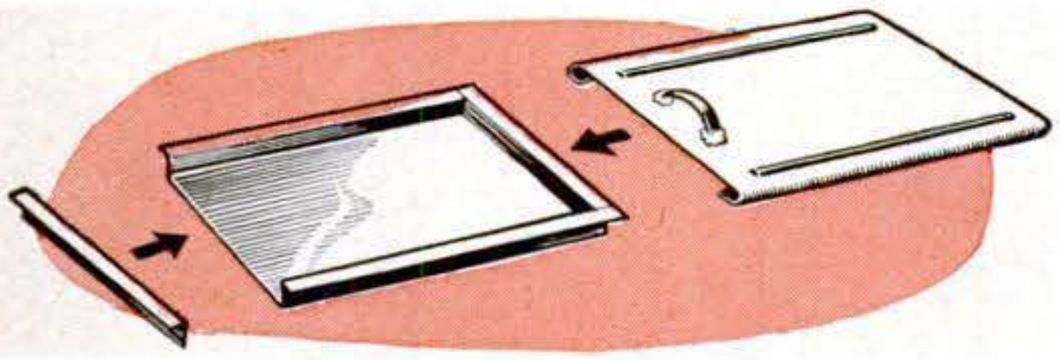
HULL SIDES are cut out and portholes punched with gasket cutter. A ½″ radio-chassis punch could also be used, or, lacking both, an undersize hole can be drilled and the portholes filed to a scribed circle.

SIDES ARE JOINED to bottom by tacks of solder. Joint is started at bow, and sides are curved to fit bottom as work proceeds toward stern. Slugs of solder (foreground) are placed on seam, leaving hand free.

FORWARD DECK is added after sides are joined at bow and hull begins to take shape. Writer found that acid-core solder was best when soldering on outer painted surfaces; rosin-core solder was used on inside.

steel wool and solder them into the porthole openings.

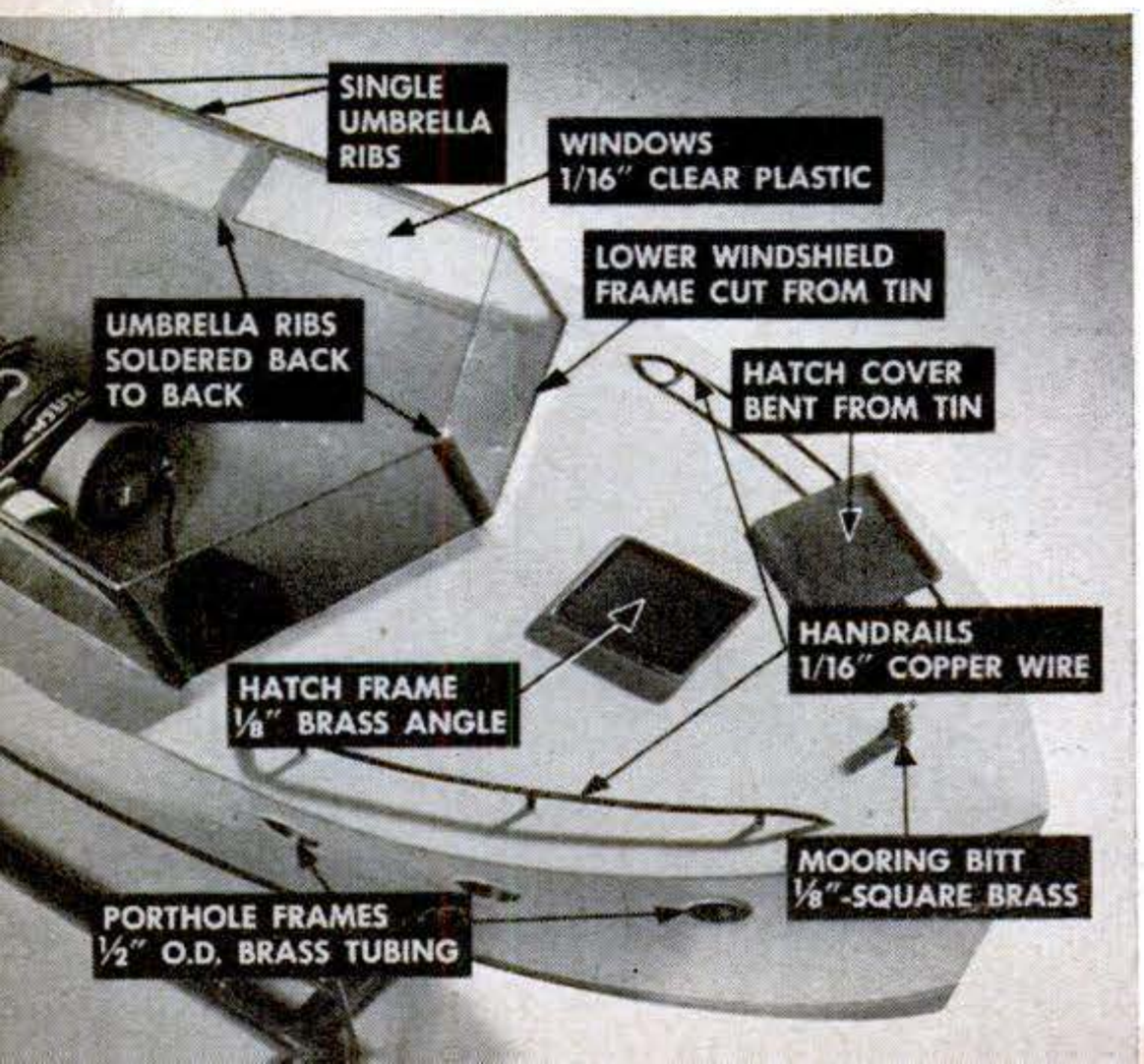
Forward deck hatch. Frame the hatch

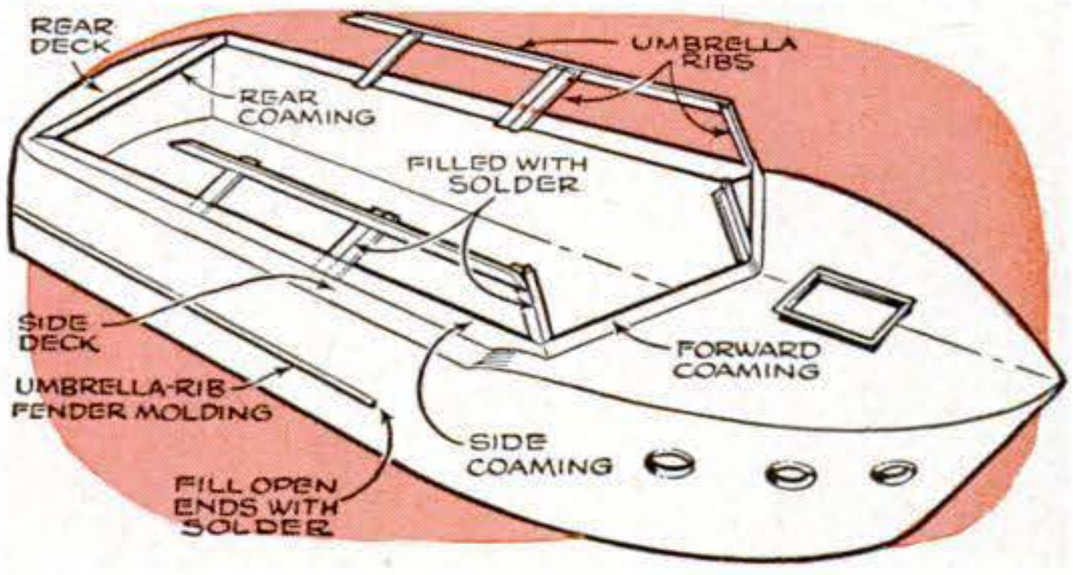


opening with ⅛″ by ⅛″ brass angle, soldering from beneath the deck for a neat job. Bend the hatch cover from a scrap and trim with two stiffening ribs and a wire handle.

Cabin. Solder short pieces of umbrella ribs to the side coamings and bridge them with long headers as shown in the assembly drawing. Cut the cabin top and bend down the flanges on both sides and the front. The side flanges snap into the headers and the front flange completes the windshield frame.

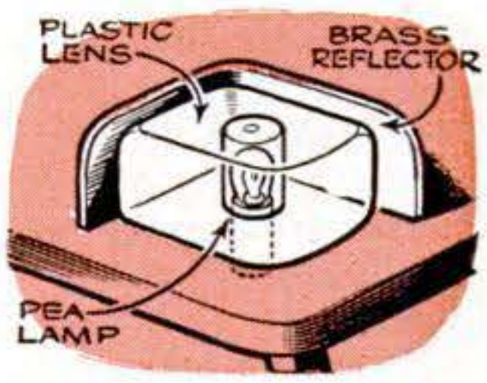
DETAILS ARE MADE from common materials—copper wire, brass angle, tubing and umbrella ribs. Note how umbrella ribs, soldered back-to-back, form neat window frames. Hatch cover slides on frame of brass angle.



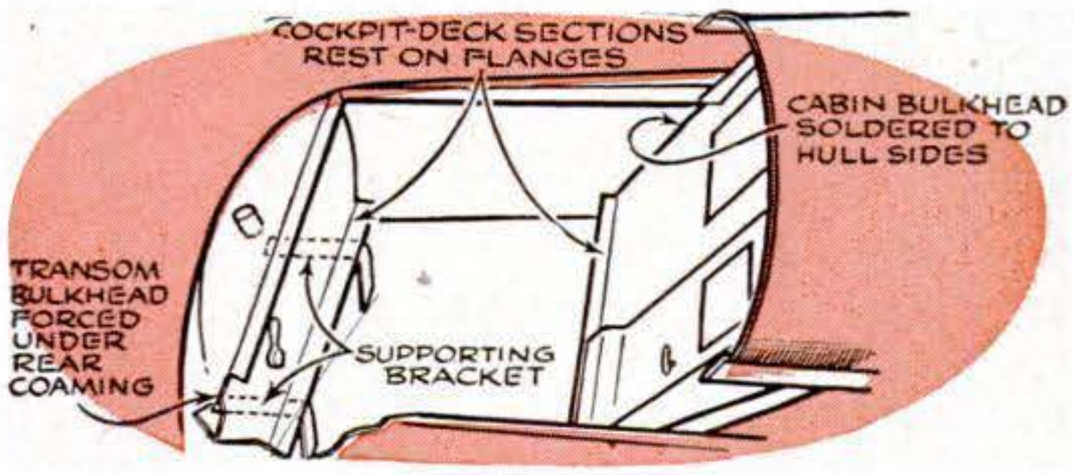


Solder copper wire along the after edge of the cabin top for edge molding.

Bend the running-light reflectors from sheet brass, solder them to the cabin top and cement the colored plastic lenses in place. Cement two surgical bulbs or modeler's pea lamps into the plastic.



Cabin bulkhead and cockpit. The cabin bulkhead is best fitted after the cabin top is formed. It's easier to trim the bulkhead top to fit the curve of the roof than to attempt to bend the roof to fit the bulk-



head. Umbrella ribs hold the plastic panes in the bulkhead window and door. Two pins on the door pivot in two little brackets, permitting the door to be opened. The cockpit deck rests on the flange bent along the

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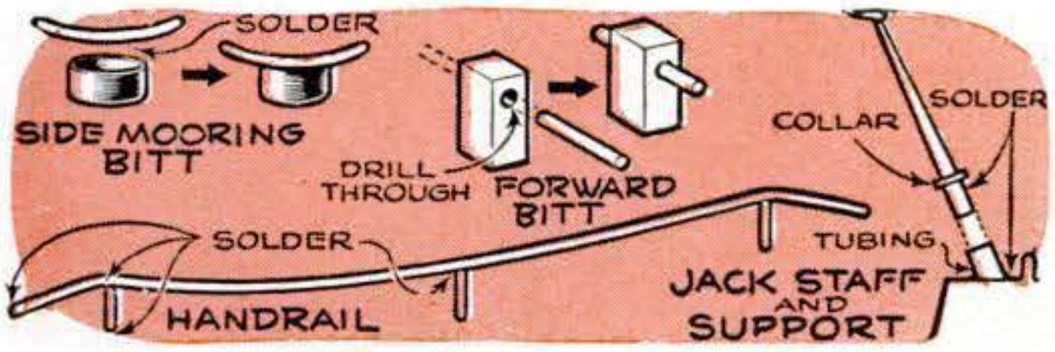
SIDE DECKS and transom are next in order of assembly. Note how transom forces sides into graceful curve at stern. This is a good time to lay a bead of solder along all hull seams, making hull watertight and rigid.

CABIN is built up of short lengths of umbrella ribs flattened slightly to receive the 1/16″ clear-plastic windows. Acid-core solder is a must here as steel umbrella ribs are seldom tinned. Windows are installed after painting.

CABIN TOP is creased lightly along half its length; crease then blends into a curve at rear to fit over cabin bulkhead. Running lights are surgical bulbs set in colored plastic. Pen-light cells clipped under roof feed lights.

bottom of the bulkhead, and on two brackets soldered to the transom. The small stern bulkhead, in which the motor switch is mounted, snaps in place behind the cockpit deck. Its upper edge is forced into the folded-over rear coaming.

Fittings and details. Small details on the model are few but effectively placed. Fabricate the two side mooring bits from a short length of brass tubing partially flattened, and a bit of copper wire. Drill through a piece of ⅛″ square brass and force a bit of wire through the hole to make the forward bitt. Assemble and solder the handrail on the forward deck, using 1/16″ wire. Chuck a length of brass rod in your electric drill and file a taper on it to form the jack

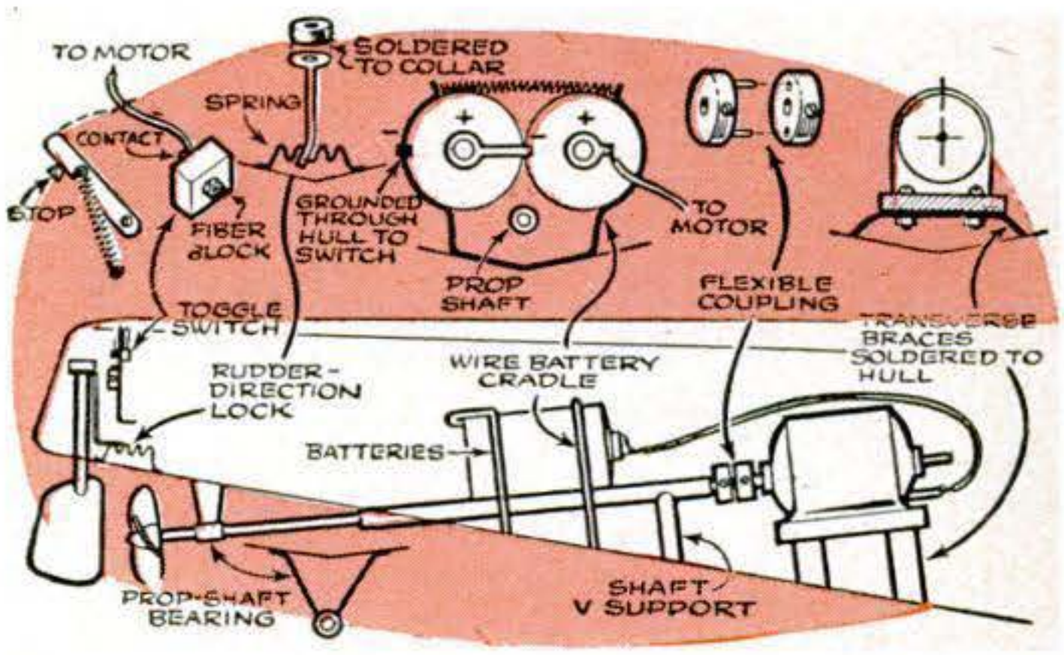


staff. Solder a bit of copper wire to the top of the staff and file it to a streamlined, airfoil shape.

Power plant. Lay the 1½ - to six-volt miniature plastic motor, along with two flashlight cells, in the completed hull. Put the cabin top on and set the boat in water. Shift the motor and batteries forward and aft until the boat sits trim on the water.

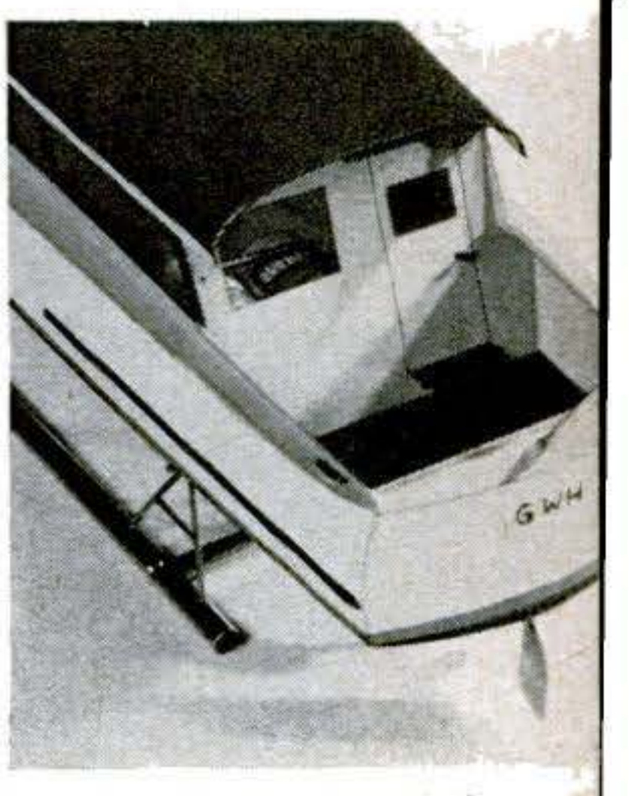
Drive a large nail through the hull bottom at a point determined by the motor-shaft location, and bend it forward to provide a formed opening for the propeller-shaft housing. Insert the shaft (brass tubing) and solder well all around it.

Mount a toggle switch on the inside of the transom bulkhead. Run one wire from the two series-connected D cells direct to



the motor. The other side of the cells and one leg of the switch are grounded, so that the circuit is completed through the hull and a single wire running from the switch to the motor.

Painting. Use care and plenty of masking tape wherever you want clean separation as at the waterline. I painted the hull bottom dark green, topping it off with a red stripe at the waterline. The hull sides I painted white, and the deck buff. The cabin top and details were finished brown. END



DETAILS AFT include umbrella-rib fender molding on hull sides (open ends are filled with solder) and mooring bitts built up from 1/16″ wire. Cabin door pivots on hinge pins at top and bottom.

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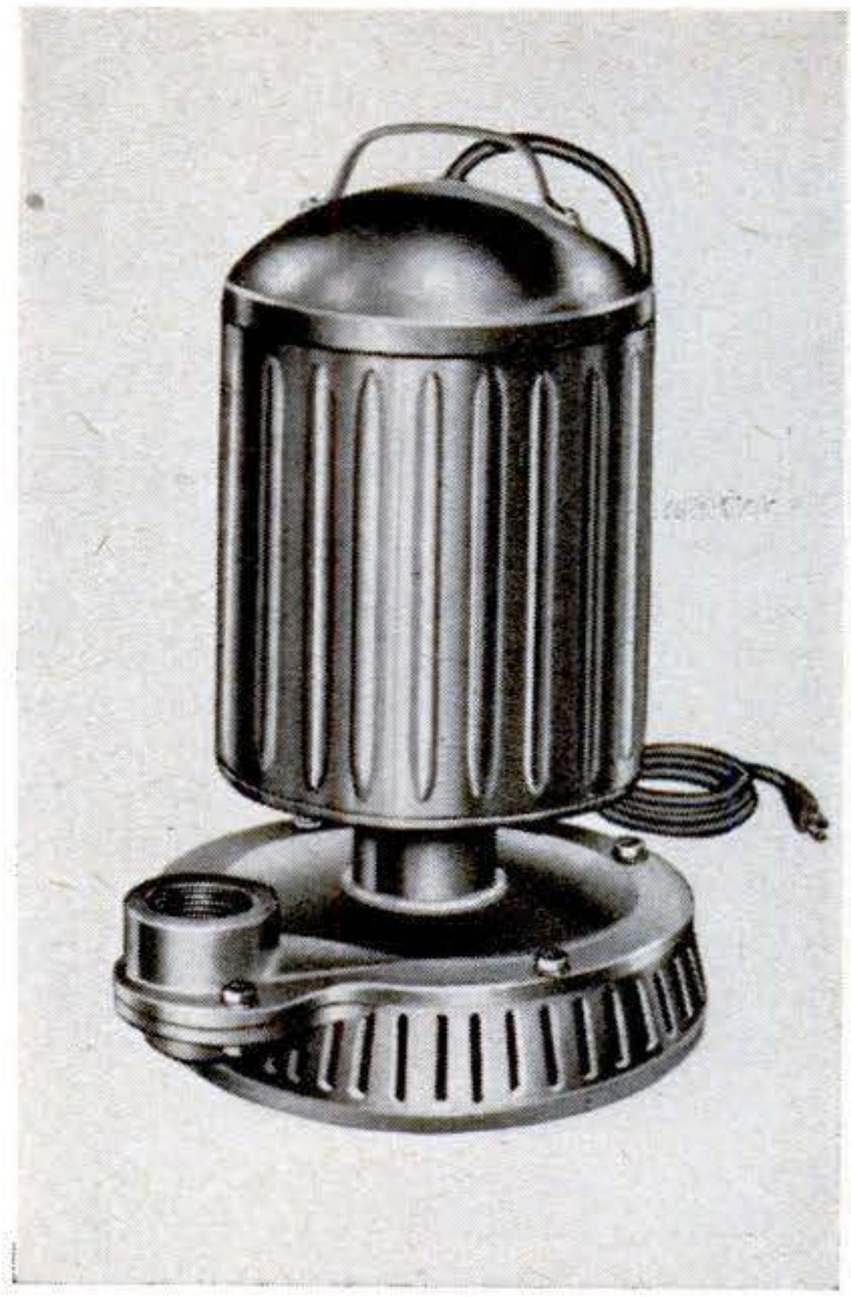
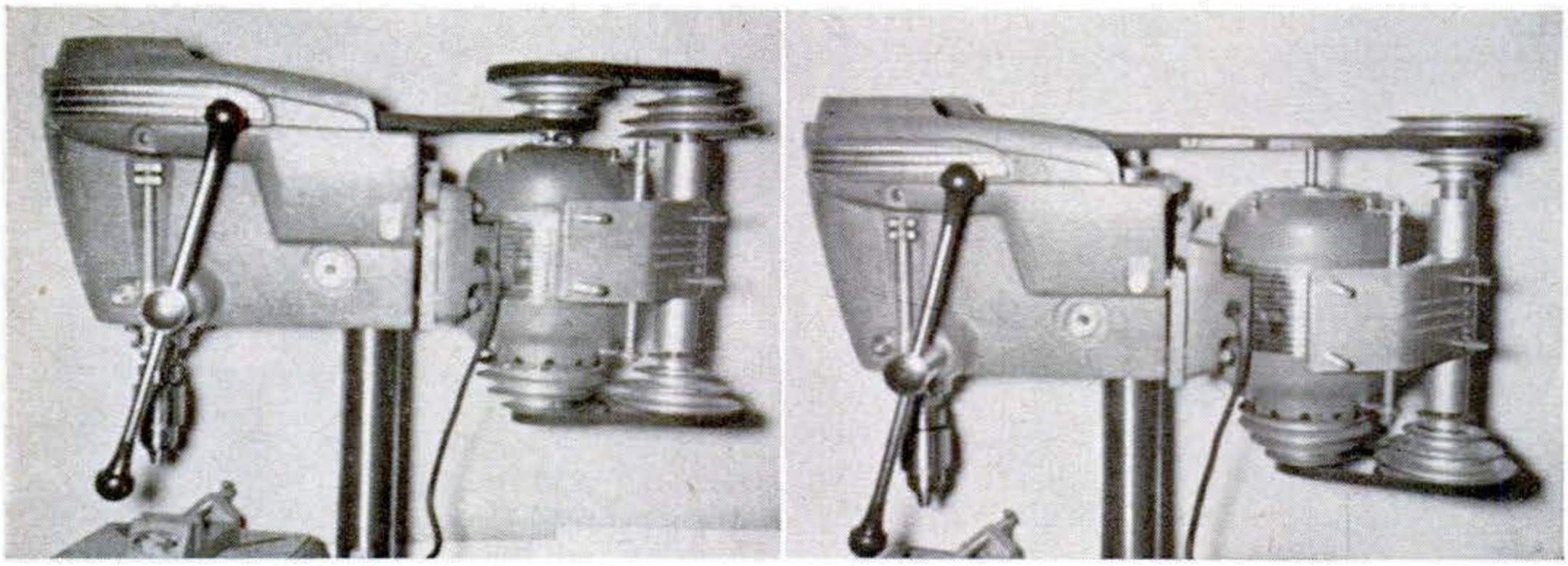
New Tools

1 Electric Hacksaw. Wood, metal, nails and hardboard can be cut with this portable electric hacksaw. Not a drill attachment, the saw is a self-contained 6¾-lb. unit driven by a 115-volt universal motor. It is 14½″ long, has a ¾″ stroke and operates at 2,250 strokes per minute. No starting hole is needed since it cuts its own. Blades are available for different types and thicknesses of materials.



3 Pump Has Sealed-In Switch. This submersible-type sump pump for draining basements or ponds has a completely enclosed on-off switch inside the stainless-steel case. There are no floats or liquid levels outside the case. The ⅓-hp. motor operates the pump under as much as 15′ of water, pumping 3,800 gallons per hour against a 5′ head and 600 gallons per hour against a 22′ head.



2 Speed Changer. Sixty-eight speeds from 96 to 26,000 r.p.m. are possible with the speed changer at left above. The pulley on the upper motor shaft floats freely. With the setup at right above, 52 speeds from 275 to 10,935 r.p.m. are possible. The speed changer can be used on all shop machines. After a pair of mounting clips has been installed on each motor, the speed changer can be moved from motor to motor. No tools are needed since the adjustment set-screws, which tighten the belts, are turned only finger tight. On a 12″ bandsaw, the changer will give a range of 214 feet per minute for metal cutting to 2,200 feet per minute for sawing wood.

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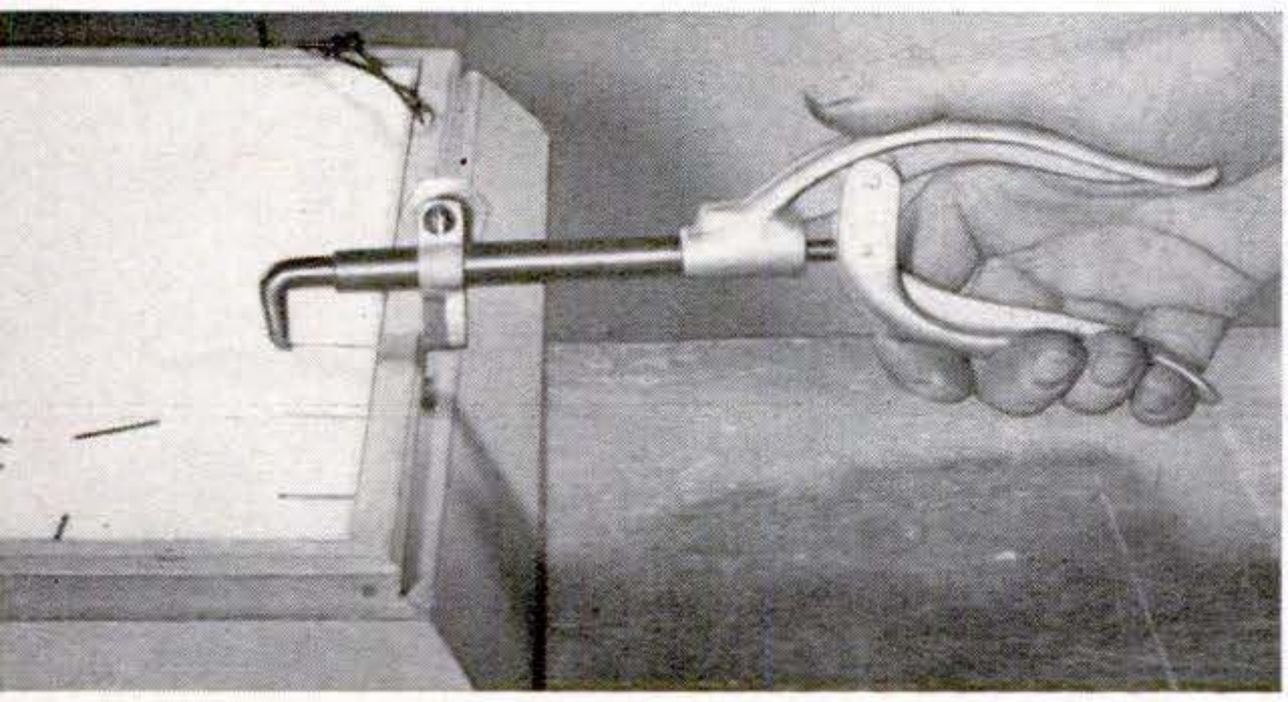
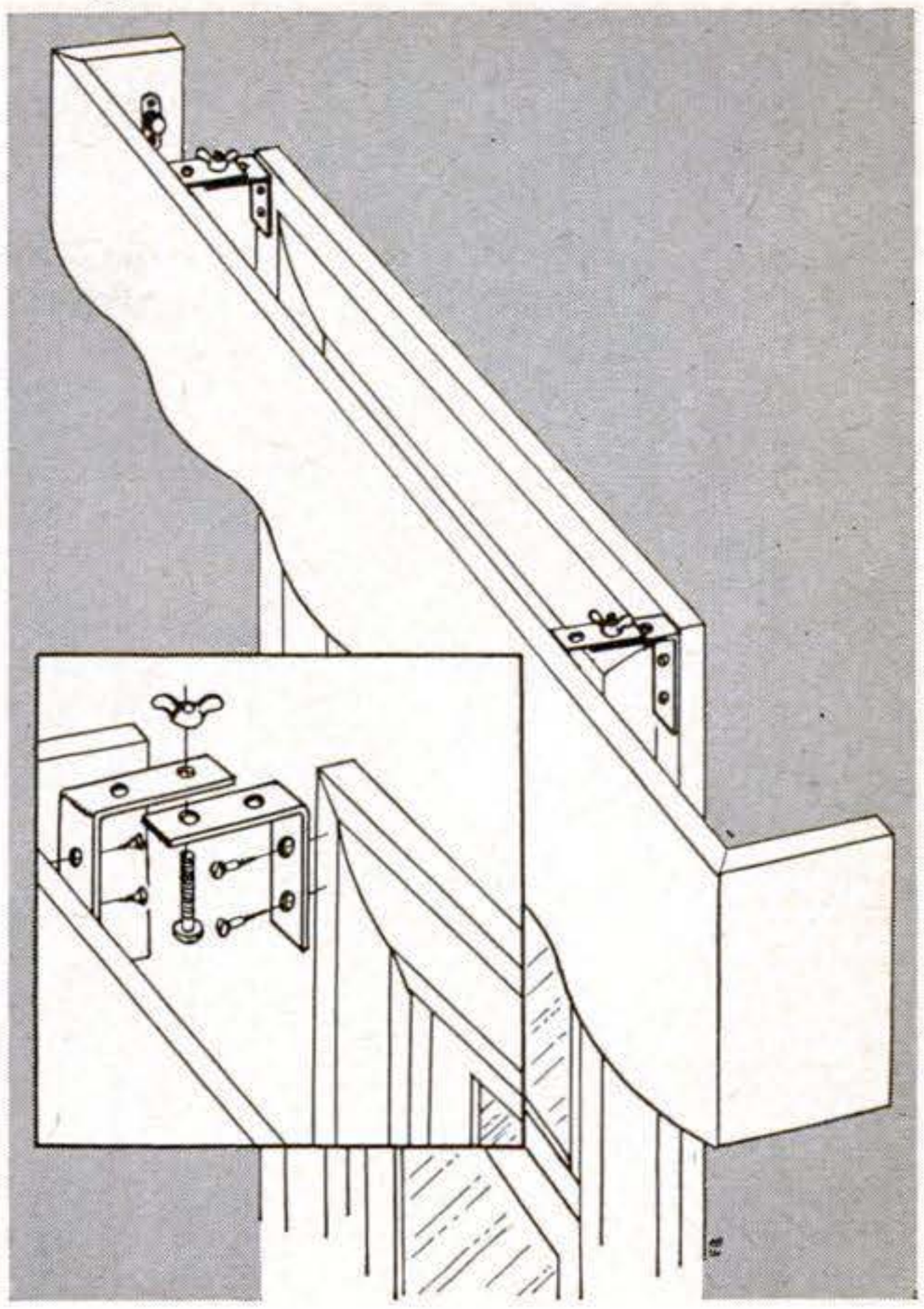
4 Guide for Electric Drill. Exact perpendicular or angular holes can be bored with this guide for a portable electric drill. The circular bubble level shows the vertical position of the drill while the contact head is calibrated in 5° divisions to show the drill position in relation to the work. The guide slides back against a spring as the drill is pushed in.



5 Tool Sets Framing Brads. The squeezing action of this tool quickly presses brads into picture frames, eliminating the danger of splitting the wood or breaking the glass by hammering. It is adjustable for frame widths from ½″ to 3″. A steel hook sets the brads while a rubber-padded clamp prevents damage to the frame.

Further information on these products can be obtained from: 1. Milwaukee Electric Tool Corp., Milwaukee 8; 2. John G. Lownsbery, 3420 Meadowbridge Rd., Richmond, Va.; 3. Jacuzzi Bros., Richmond, Calif.; 4. Roy Silver Corp., Devon, Conn.; 5. Jewett Products Co., Woodbridge, Conn.

Angle Brackets Hold Cornice



FOUR angle brackets and a couple of bolts and wing nuts simplify installation of a cornice. If the holes in the brackets do not put the cornice at the distance from the wall that you want it, you can drill new holes. Clamp each pair of brackets together and drill both at once. *—Edward Bryan, Floral Park, N. Y.*

Salvaging Trash Cans

YOU can replace the rusty bottom of an old rubbish can by cutting some scrap boards to the can's diameter and nailing them together with battens. Insert the new bottom in the can and nail it to the metal sides as shown in the photo. *—Walter Haase, Hartford, Conn.*

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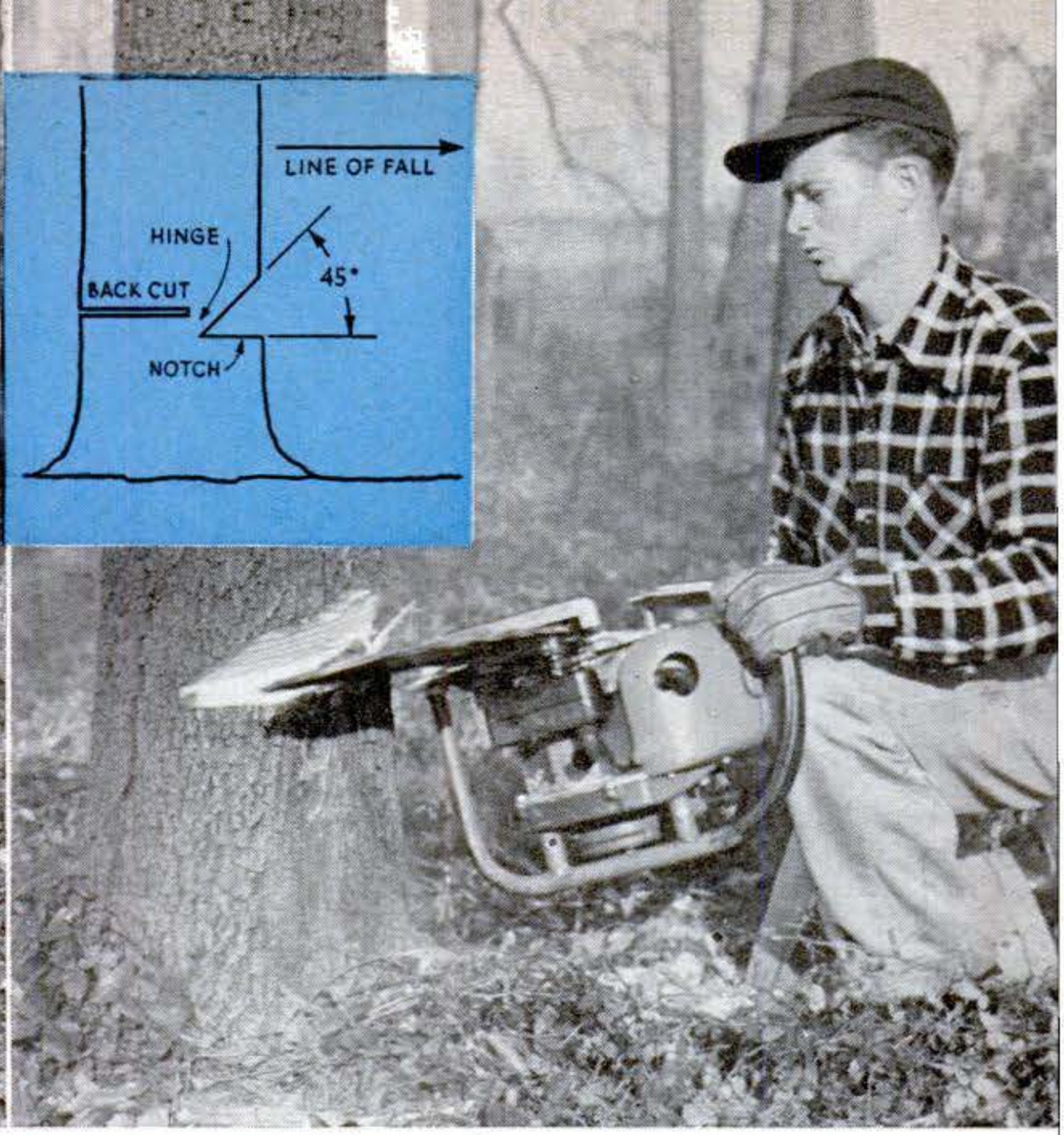

1. PREPARATION. Clear away all undergrowth from around tree with an ax; don't use saw on small saplings because they may whip. Select a line on which you wish tree to fall, figuring on natural lean, wind and location of trees that might hang it up. Take a firm footing, position saw before starting chain.

2. NOTCHING. The undercut, or notch, controls direction of fall, which will be perpendicular to it. Notch should be a quarter to a third of tree diameter. Clean out all wood from it so tree will fall true. Brace body against motor frame so that if saw binds and kicks you will be shoved rather than struck.

How to Use a Chain Saw

The staccato bark of this speedy little power tool can be heard around a growing number of farms and homes, too. Here are basic rules for using it safely and effectively.

ANYONE who has served his time at the end of a two-man crosscut gets some surprises the first time he uses a chain saw. To begin with, it's light—three horsepower may heft at less than 30 pounds. It's noisy—after a couple of pulls on the starter handle it starts barking in an alarmingly business-like way. And it's fast—racing steel teeth bite into hardwood at a dizzy pace, and cuts that would take minutes by hand are done in as many seconds.

Often a whole job of felling, limbing and bucking into cordwood is finished before a man with ax and crosscut would be ready to cry "Tim-ber-r-r!" This speed can be a hazard. Says a government handbook:

"Men unaccustomed to using a chain saw will be surprised again and again at how fast it cuts. Either in felling or bucking, the cut will often be finished before they expect it. It is important that provisions for the getaway . . . become almost automatic."

Now that these potent little power tools have spread from lumbering operations to thousands of farms, wood lots and homes, too, safety and efficiency in using them grows increasingly important. Like all tools, chain saws do best when their users know a few tricks. The photos and drawings show basic chain-saw techniques.

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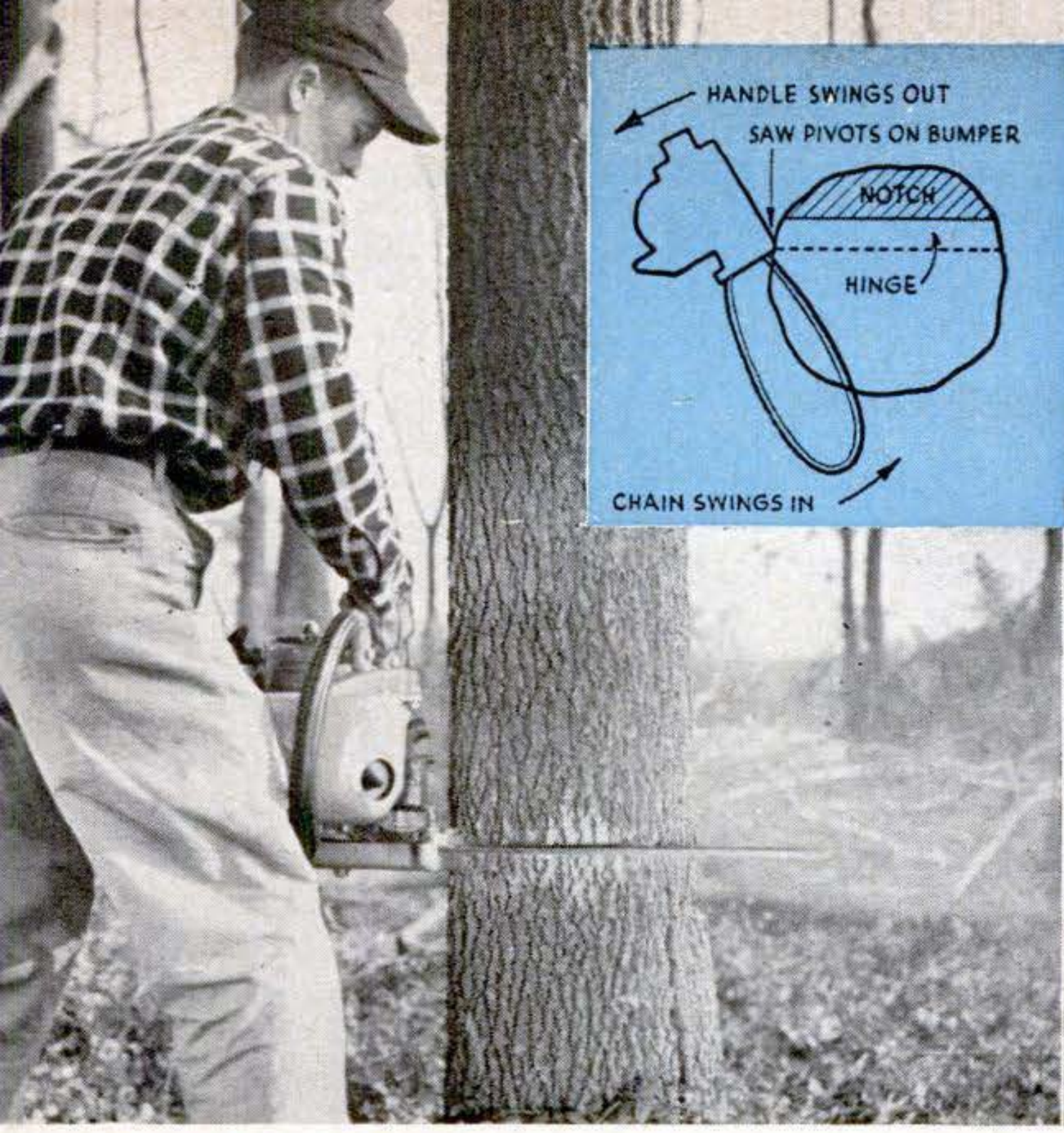
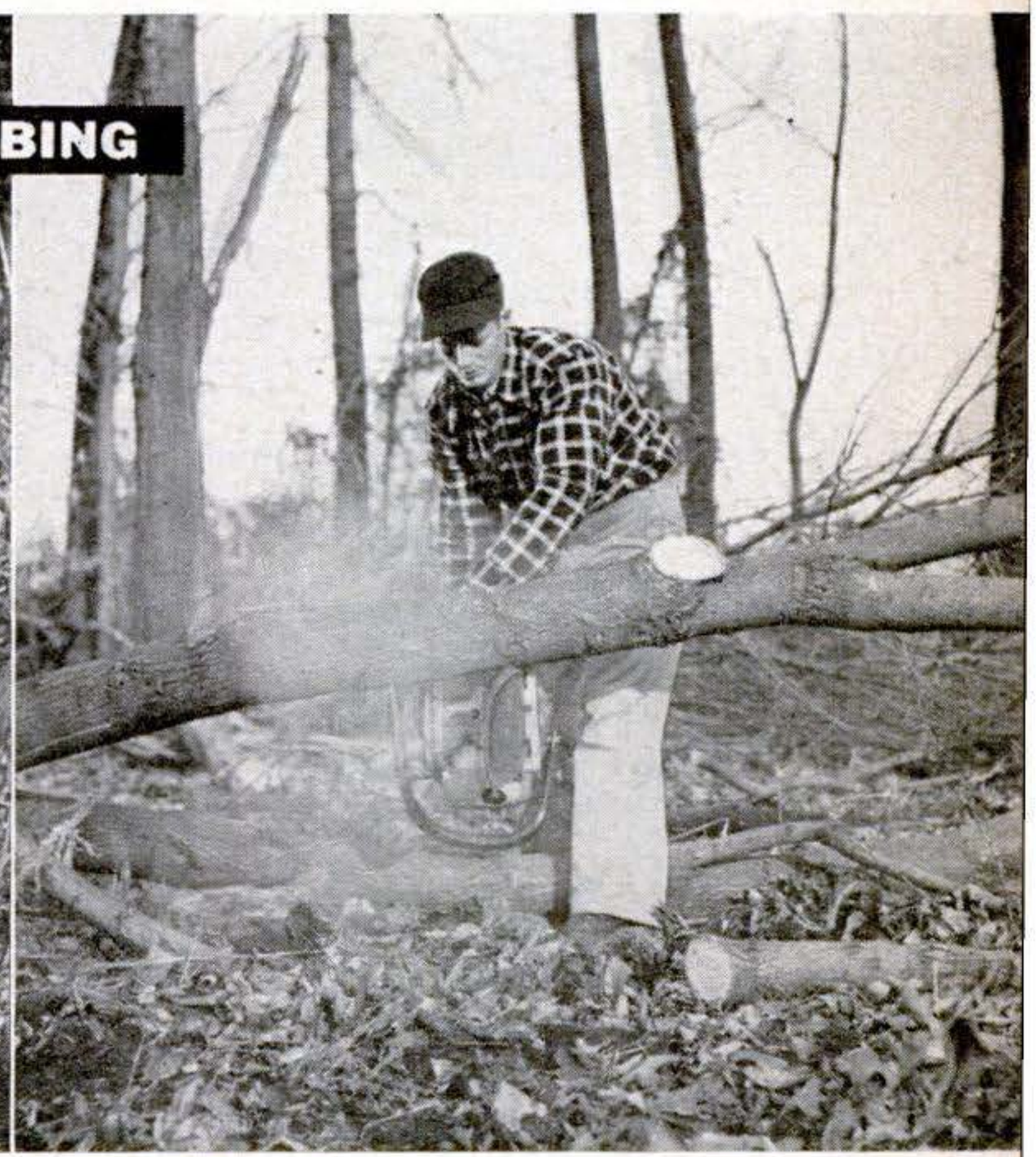


3. BACK CUT. This is made horizontally, about 2″ higher than level part of notch. Do not cut through to notch; always leave a band of wood parallel to notch for a hinge. Because chain pulls motor bumper tight against tree, cut must be made in an arc, pivoting on plate. Keep both hands on handles while chain runs.

4. TIMBER! Path of retreat should be laid out before back cut is started. During the cut, keep alert and ready for a quick getaway. The moment tree starts to tip, shut off power, put saw on ground well back from stump and keep going another 25′ or 30′ before stopping to watch. This man is slow about it.

LIMBING

REMOVE branches and limbs before bucking. First use an ax to lop off brush and small limbs; then use saw on heavier limbs. Note how man has shoulder braced against limb and leg against tree trunk. Fallen timber can **store pressures and tensions like a giant clock spring; study effect of a cut before making it.**



UNDERCUTS are handy on limbs supported at both ends. Be sure bumper is tight against tree before chain touches or the pull of the teeth will jerk the saw sharply. Be ready during cut to kill the power and pull out fast; **never saw with the throttle locked open.** ***Please turn the page for more on chain saws.***

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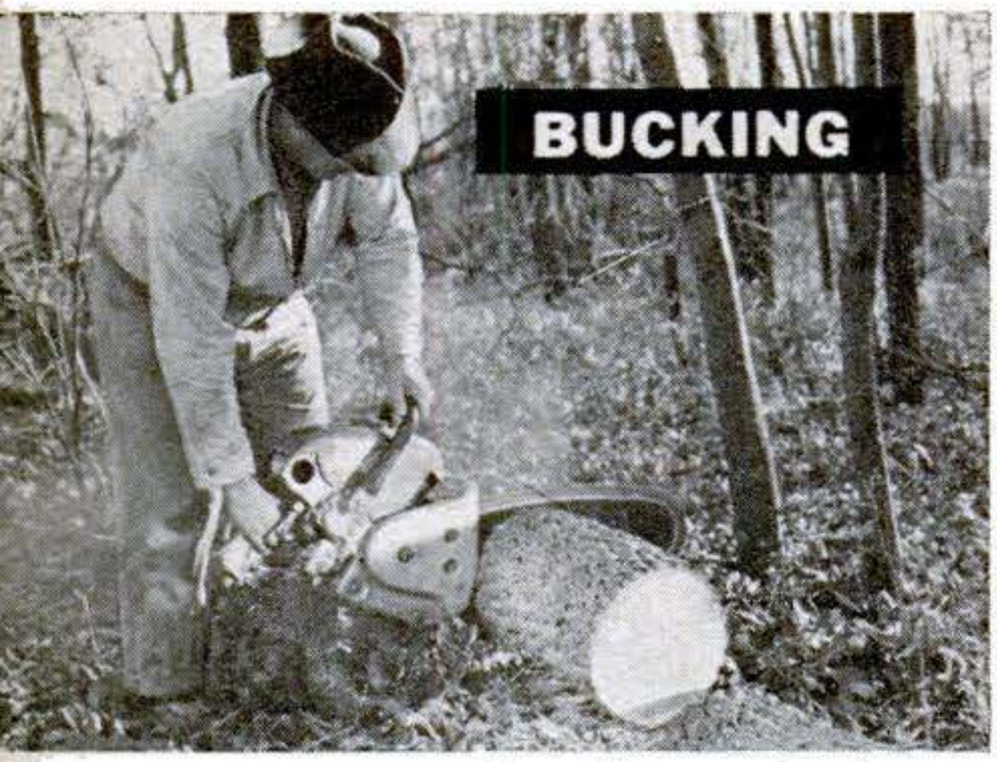
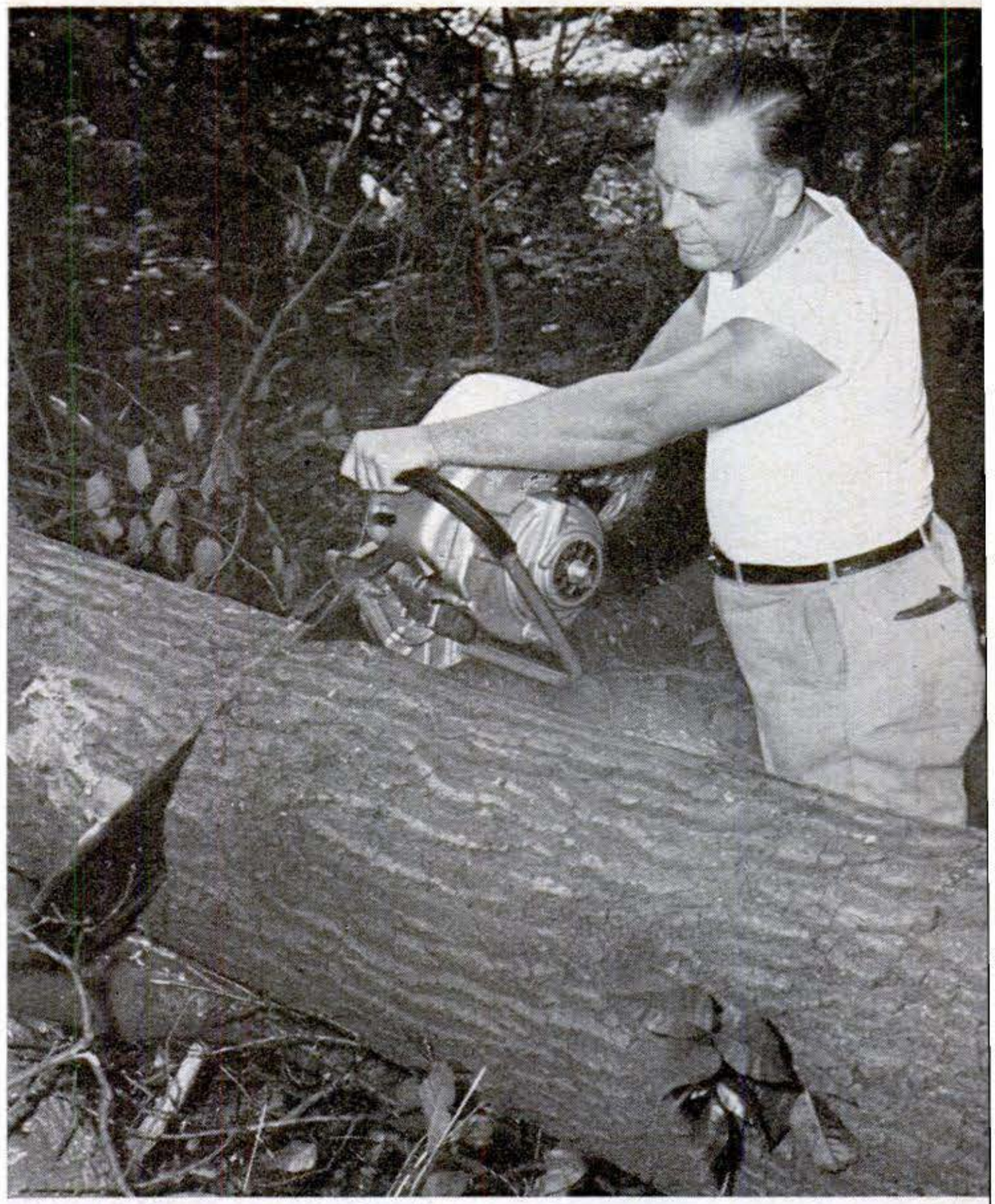


IT'S A BREEZE when the saw log hangs over this way—you lop off lengths like slicing a hot dog. Watch out for overconfidence, and for a shift of the trunk when the cut piece drops off. The saw shown is a Disston.

TAKE IT EASY when the log is flat on the dirt because stones can blunt a chain in an instant. Best bet is to quit an inch from ground, later roll the log and separate the pieces.



IT'S A BOTHER to cut a bridged log because the pieces being cut pinch the chain. First make cuts elsewhere that may destroy bridging, roll or pry up log, or make an undercut. On a cut like this, stop chain if pinching develops, drive wooden (not iron) wedge into kerf.

CHAIN-SAW SAFETY RULES

1. Always stop engine before making any adjustment to it or to the chain.

2. Always keep one hand on the handle bar and the other on the control grip when cutting. Never lock the throttle open—use the throttle lock only for starting.

3. Never allow the end or top of the chain to touch any branch or obstruction—the saw will kick up or back if it does.

4. The tension of the chain should be checked frequently and tightened if necessary.

5. Never wear loose-fitting gloves, ties, shop coats or other loose clothing.

6. Never carry a running saw—play safe and stop the engine.

Source: Homelite Corp.

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"Sorry, Joe. I don't lend my tools to anybody."

"Nothing personal, understand. But you should have learned long ago to build your kit around good tools.

Look at those Bonney tools of mine. Cost less than you think, and for my dough the best any mechanic can buy.

If you're short of cash right now, get yourself some BON-E-CON* wrenches. They're real mechanics' tools with the regular Bonney guarantee, and priced so that an apprentice can afford them.

With those as a starter, before you know it you'll build up to a kit like mine."

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For a Real Shine...

Buff It!

Before. Dull, drab and tarnished, these ornaments resemble museum pieces. Some people prefer them that way, but . . .

After. The rich glow of polished copper, and the highlights of the gleaming silver can now be appreciated. Buffing did it.

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The magic cotton wheel really shines when it comes to removing tarnish, pits and scratches from your metalware. It gives a factory finish at home.

By William P. Vogel

FEW workshop operations are as satisfying as buffing. With little effort, dramatic changes take place right before your eyes. Those winter-weary brass andirons with the baked-on coating of soot will regain their gleaming-new finish almost the instant they touch the buffing wheel.

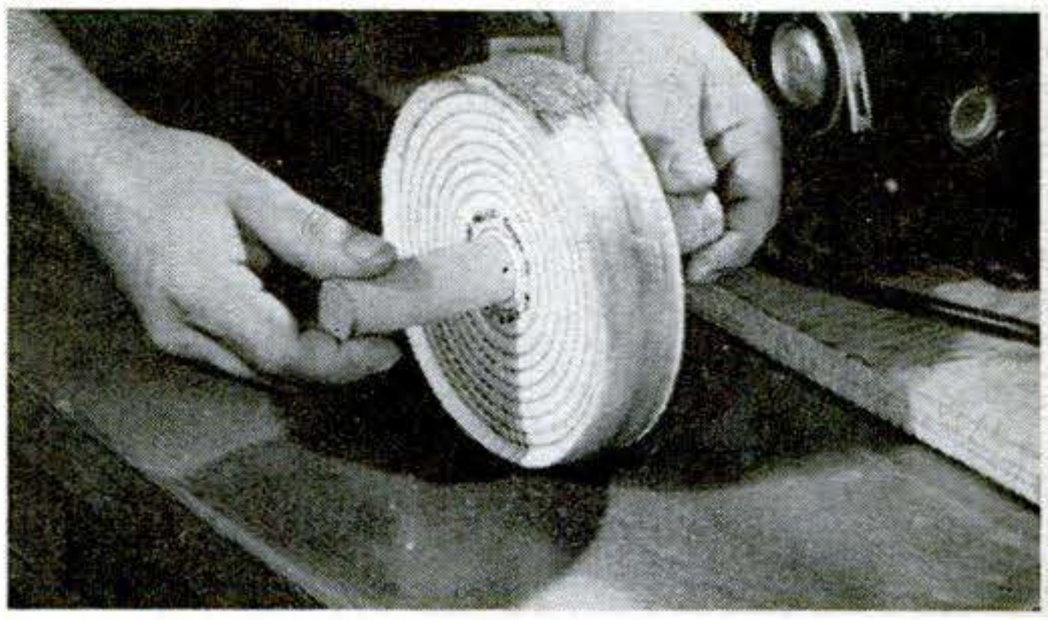
Almost any metal object that was shiny once will respond to buffing: wall-switch plates, decorative copper pots, silverware, door knobs and knockers—a highly polished door knocker on a freshly painted front door adds the same touch that a monogram gives to jewelry. Your divot-happy golf clubs, buffed bright for the first game of the season, may not help your score but will reflect more sun into your opponent's eyes.

Three steps in buffing. The process of restoring a gleaming finish to a pitted or badly tarnished metal surface involves three operations. The first is *polishing,* which, surprisingly, is the term for a coarse preliminary operation done with a specially prepared *polishing wheel.* This removes the pits and scratches, and prepares the surface for the next operation, *cutting down.* This is actually buffing with sharp buffing compounds that remove the smaller surface imperfections and leave the metal bright. *Coloring* is the final buffing, done with soft compounds, to bring out the natural luster and color of the metal.

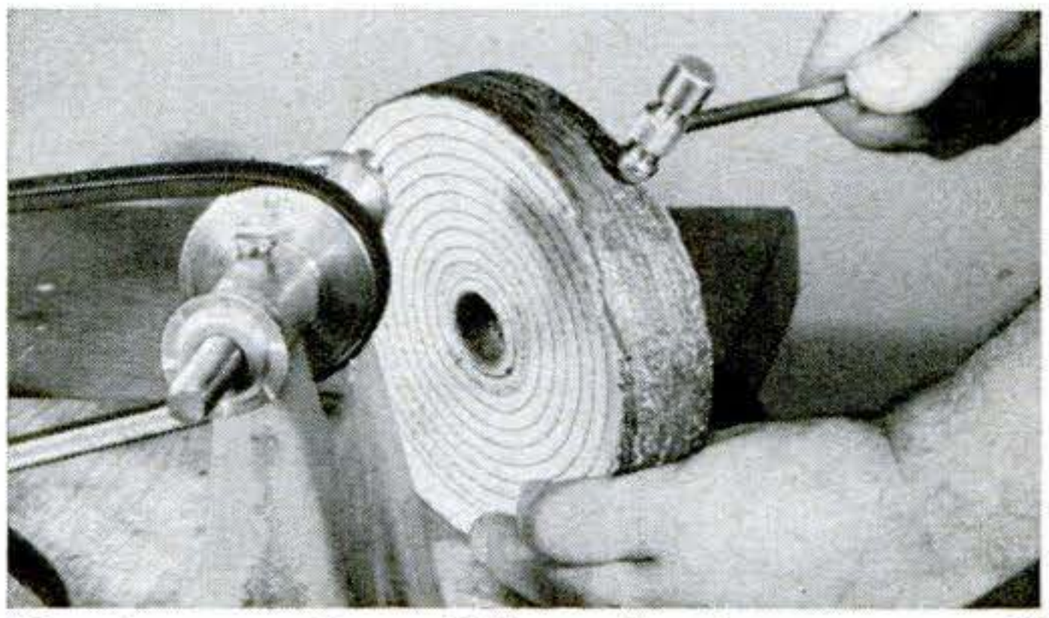
Selecting wheels. Before you rush out to buy an assortment of buffing wheels, consult the data card following this story for the wheel diameter and thickness best suited to the horsepower and speed of your motor. Buffing wheels are made in various types for different operations. *Spiral-sewed wheels* are stitched in a continuous circle from center to face, making them hard and well suited to cutting down. *Cushion-sewed wheels* have only two or three rings of stitching to provide a resilient, cushioning effect. Softest are the *loose wheels,* which are joined by a single circle of stitching around the arbor hole. Loose wheels are also made in flannel.

Buffing techniques. Knowing what wheel to use with what compound on what

Size with glue. Mount several spiral-sewed wheels on a dowel and roll them in liquid glue poured on waxed paper. Smooth out blobs of glue with fingers and hang wheel to dry for about 24 hours. When dry, sand smooth to remove loose or projecting threads.



Apply powdered grit. Roll wheel again through glue and then through abrasive, such as No. 280-grit silicon carbide. Roll wheel back and forth without pressing until entire surface is coated. For fast work, make a second wheel using a coarser grit, such as No. 120.



Break up surface. When glue dries, scrape off loose abrasive and tap face of wheel with ball-peen hammer to produce hundreds of tiny cracks, making the wheel flexible enough to follow contours. Break in wheel on a piece of scrap before putting it in service.

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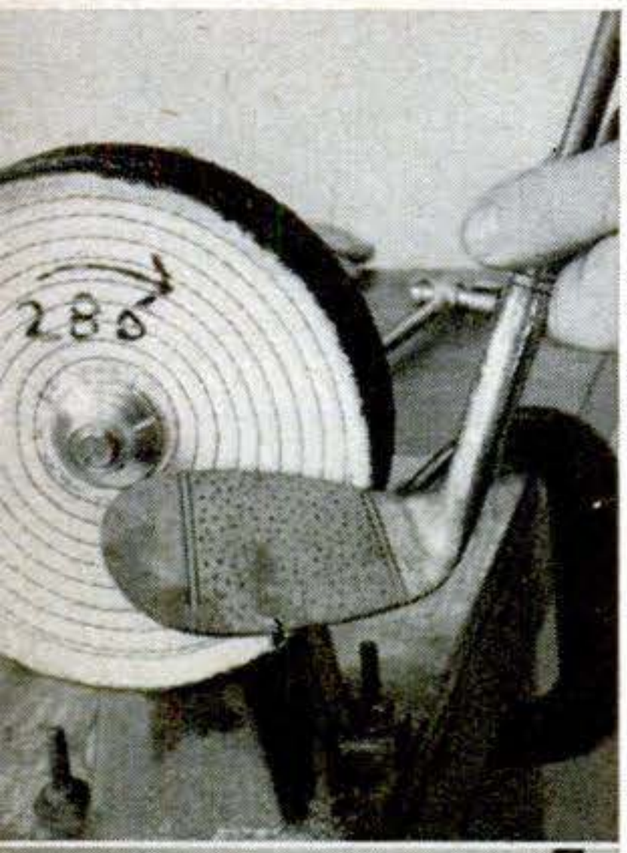
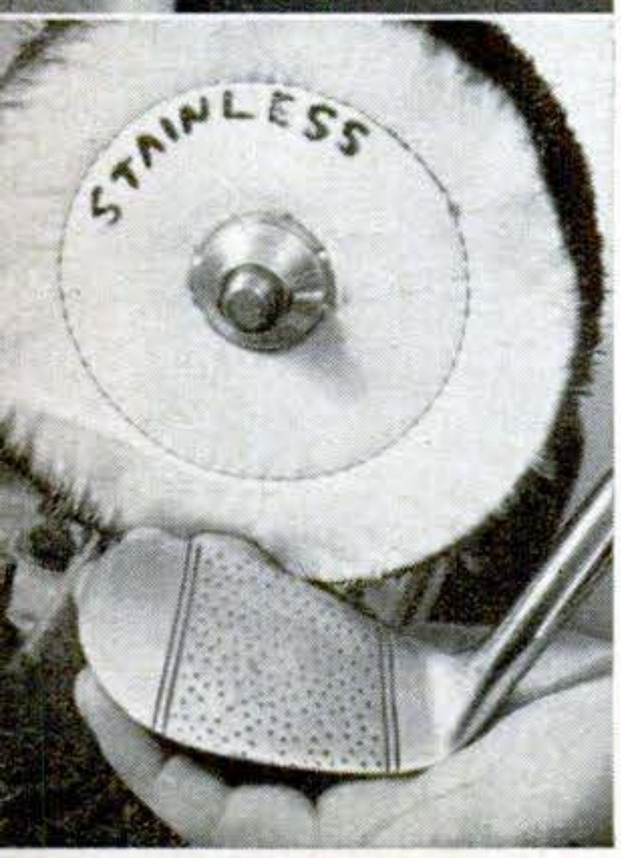


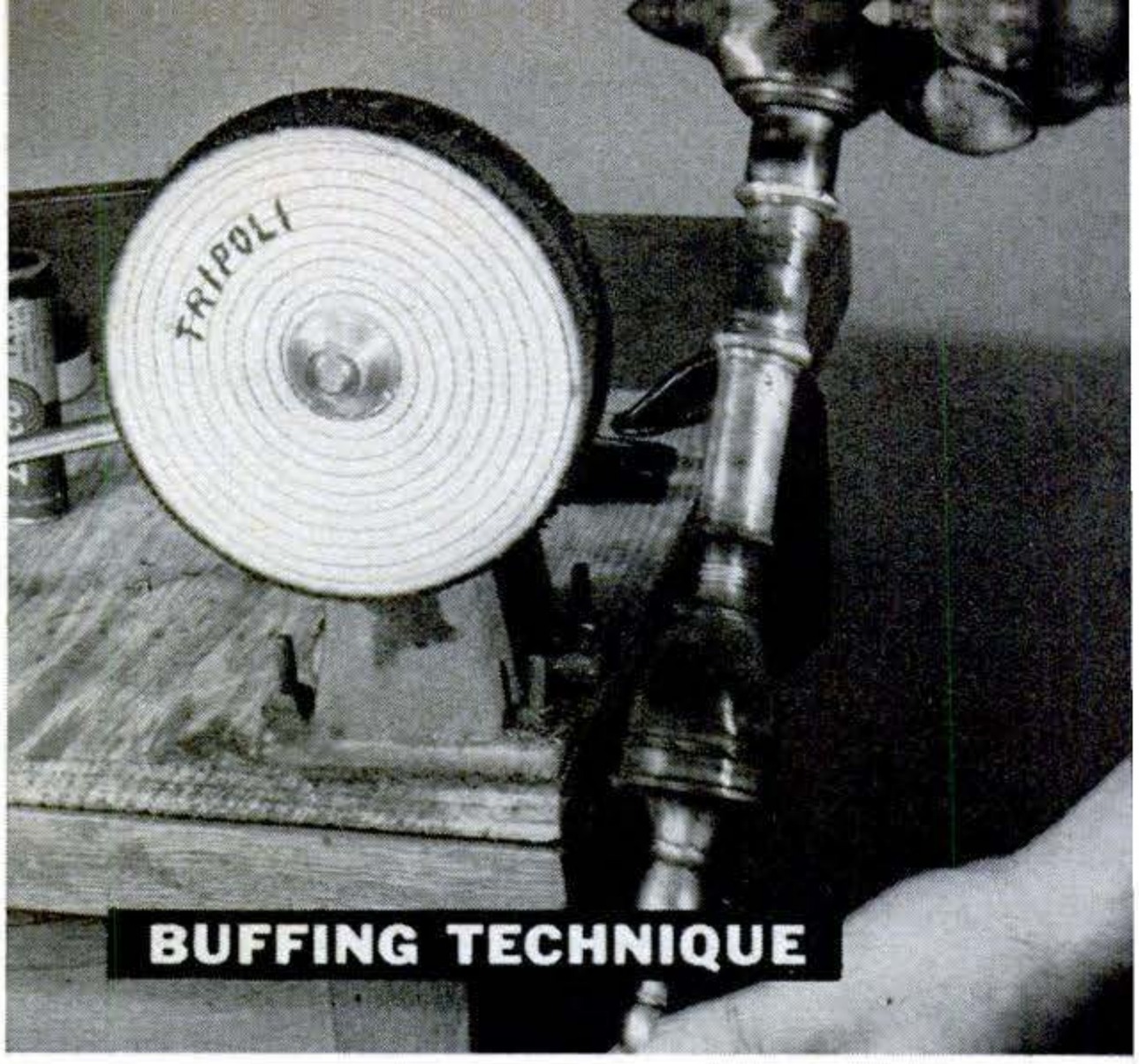
Rusted golf club is good subject for abrasive-coated wheel. Ink an arrow on wheel so you can always mount it to turn in same direction. No. 280 marked with India ink on wheel indicates grit size. Properly made, abrasive wheel will give long service.

It cuts fast. Rust disappears almost immediately—pits and scratches take a little longer. After good working over with abrasive-coated wheel, club is bright, smooth and ready for cutting-down and coloring operations with stick compounds applied to uncoated wheels.

New buffing wheel, charged with emery buffing composition, is used to remove fine scratches left by abrasive wheel. Mark wheels according to compound used on them and use them only with that compound. Use solid, spiral-sewed wheel for cutting with emery.



Coloring steel club. After cutting down the club head to smooth off the surface, use a soft, cushion-sewed wheel charged with stainless compound to bring out the final factory finish. Hold work firmly against the wheel, slightly below the center of the spindle.



BUFFING TECHNIQUE

Cutting down. If work is badly tarnished or coated with soot as is the brass andiron above, cut down to the metal with a spiral-sewed wheel charged with tripoli. If wheel loads up with dirt, clean it by holding an old file against it, and recharge it with compound.

material is only half of your buffing education. The other, equally important half is knowing how to use your equipment. Here are some tips:

- Leave your necktie in the closet. The

Preserve finish by coating with clear lacquer or plastic spray. Before coating work, clean off greasy residue left by buffing compounds with rag dipped in powdered whiting, which you can get at any drugstore. Follow with thorough washing with carbon tetrachloride in a well ventilated place—preferably out of doors. Silverware or other items that must be washed or subjected to heat cannot be lacquered.

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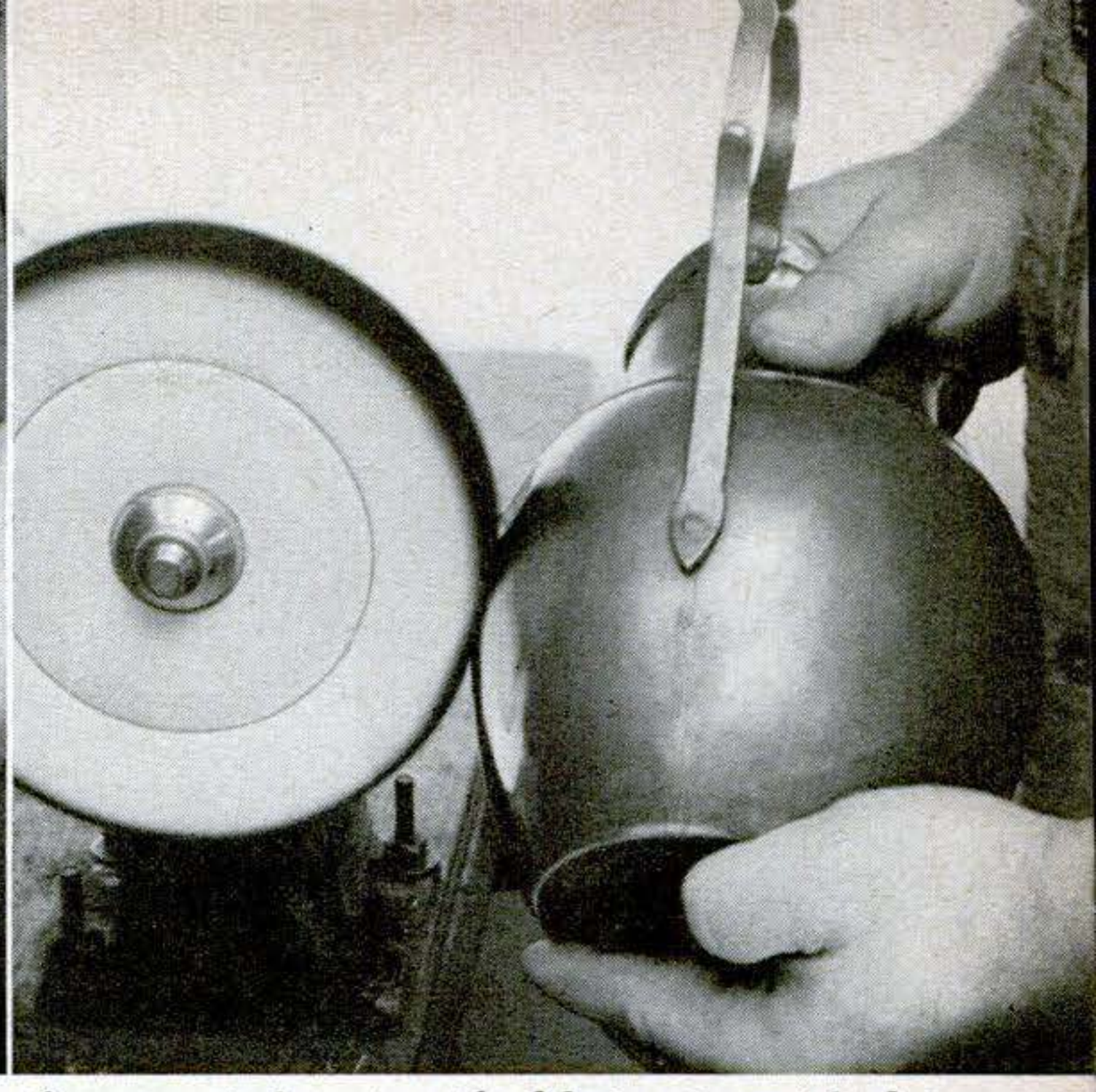
Coloring. Soft metals—brass, copper, silver and gold—are colored with rouge applied to a soft cushion-sewed wheel. The coloring operation can be hastened by speeding up the wheel, but this is not essential. Use light up-and-down strokes, turning work steadily.



Copper pitcher, tarnished but not scratched, is cut down mildly and colored in a single operation, using tripoli on soft cushion-sewed buff instead of spiral-sewed wheel used on andiron. Extra-fine finish can be applied with rouge on very soft loose flannel wheel.

workshop is no place for a tie anyway, and the buffing wheel is the last place.

- Wear gloves unless the work is so small or delicate that gloves are impractical. Much heat is generated when buffing and the work often becomes uncomfortably hot.
- Wear a shop coat and hat to catch the layer of black or red dust that will settle on you.
- Hold the work firmly against the buffing wheel slightly below the spindle center and move it up and down—up to get the maximum cut, down to blend the cuts together.
- Never take your eyes off the work—not even for a moment. The fast-moving wheel can snatch the work away from you, especially when it strikes an edge.
- Stop and inspect the work frequently while cutting. When the many fine lines and scratches are blended out, you are ready for coloring.
- Respect the buffing wheel as you would a friend who is helpful but a bit short-tempered.

END

BUFFING

Buffing-Wheel Selection Chart for Various Motor Sizes

Motor Size	Recommended Wheel Thickness: 4" dia.	6" dia.	8" dia.	10" dia.
1/6-1/8 hp.	1"	1/2"	.....	.....
1/4 hp.	1 1/2"	1"	1/2"	1/2"
1/3 hp.	2 1/2"	2"	1 1/2"	2"
1/2 hp.	3"	2 1/2"	2"	

Formula for Calculating Surface Feet per Minute (s.f.p.m.) (Ideal Buffing Speed Is 5,000 s.f.p.m.)

$$\frac{\text{dia. of wheel}}{4} \times \text{r.p.m. of spindle speed} = \text{s.f.p.m.}$$

Example:

$$\frac{6''\text{-dia. wheel}}{4} \times 3{,}450 \text{ r.p.m.} = 5{,}175 \text{ s.f.p.m.}$$

Types of Buffs and Compounds for various Materials

Material	For Cutting: Wheel	Compound	For Coloring: Wheel	Compound
Iron, Steel, Hard Metals	Spiral Sewed	Emery or Stainless	Cushion	Stainless
Brass, Copper, Aluminum, Soft Metals	Spiral Sewed	Tripoli	Cushion or Loose	Stainless or Rouge
Brass or Copper Plate	DO NOT CUT		Loose, Cushion or Flannel	Tripoli or Rouge
Solid and Plated Gold or Silver	DO NOT CUT		Flannel	Natural Rouge or Jeweler's Rouge
Nickel or Chrome Plate	Spiral Sewed	Stainless	Cushion or Loose	Stainless
Plastics	Cushion or Loose	Tripoli or Stainless	Loose	Stainless

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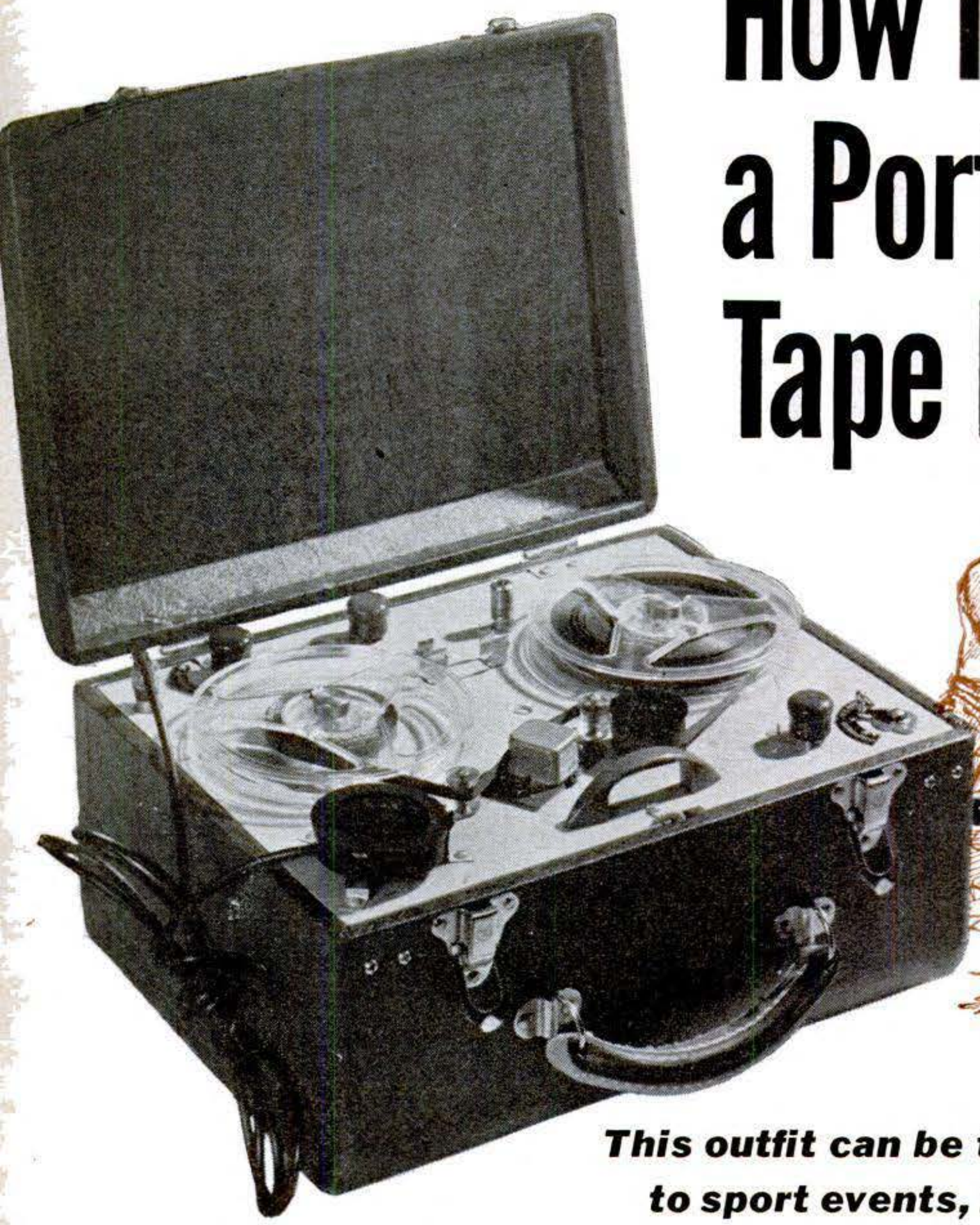
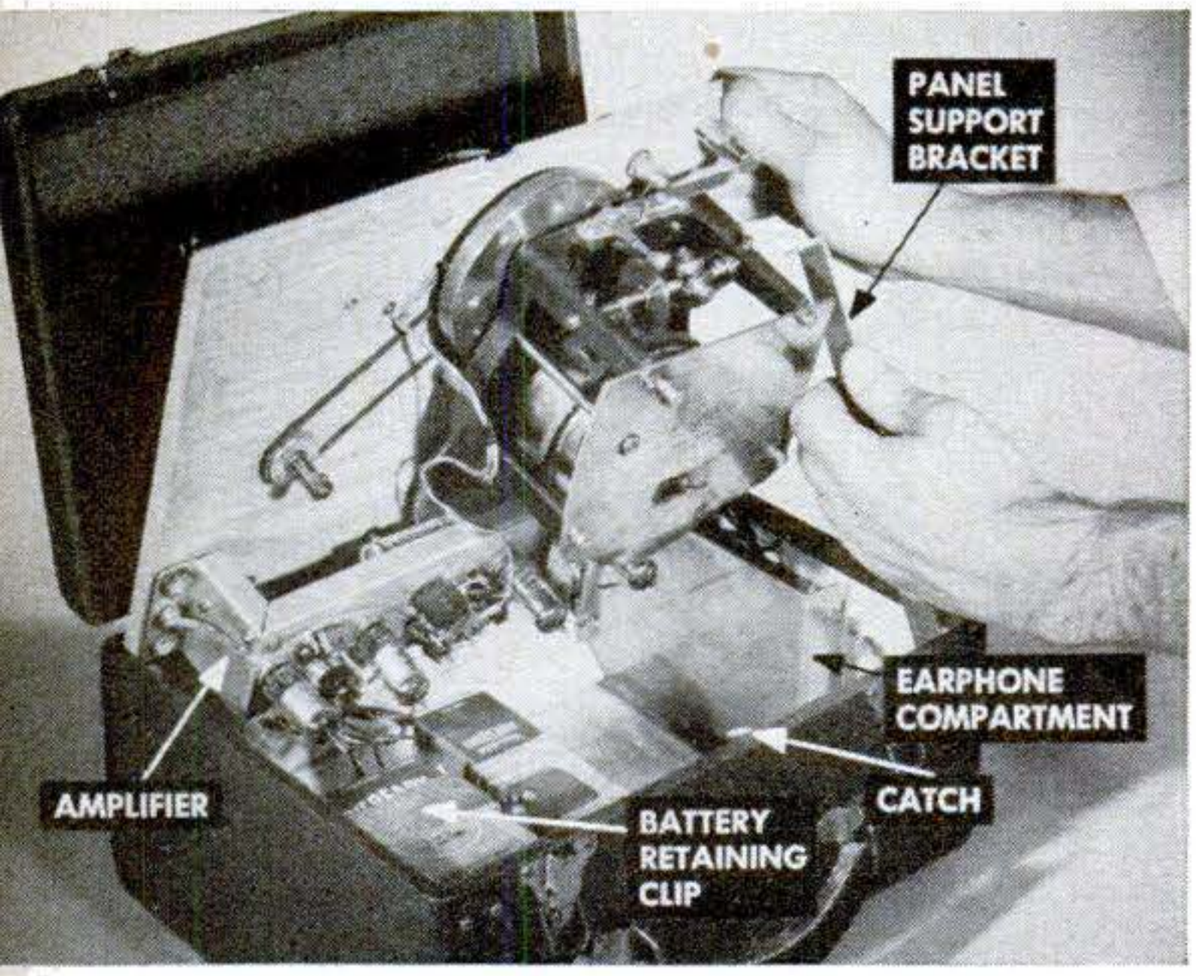
How I Built a Portable Tape Recorder



This outfit can be taken on picnics, to sport events, in a boat or car. A spring motor and batteries make it independent of power lines.



PANEL IS HINGED at the back and rests on small angle brackets at the front. A catch secures it for carrying. The long bracket at the right holds up the panel for convenient access to the batteries, tubes and motor.

By Howard G. McEntee

ONCE you get a yen for a tape recorder, you get it bad. Mine was complicated by wanting a wholly portable outfit. I was willing to pass up high fidelity provided I could take the rig any place—without a line cord mooring me to a 115-volt outlet.

You can buy such outfits, but they tap the budget for $225 and up. The parts for a recorder that would suit me figured out to a fraction of that, so I tackled the job.

Even using what ready-made parts you can, this is no kitchen-table project. Certain parts must be machined on a lathe and drill press. Unless these parts run dead true, you'll never get the wows and quavers out of your sound. But it isn't hard to make them accurate with the right equipment.

The case. Something the luggage stores call a train case, measuring 7″ by 10″ by

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13″ outside, holds the whole works of my recorder. The lower part, without the lid, should be at least 5½″ deep.

The motor. Even a small battery motor would take a lot of expensive dry-cell juice and be hard to regulate. I used a husky two-spring phonograph motor. This runs off half a 5″ reel of tape at a winding, giving seven to 15 minutes of operation, depending on tape speed. A lighter single-spring motor wouldn't do; my big one just gets by.

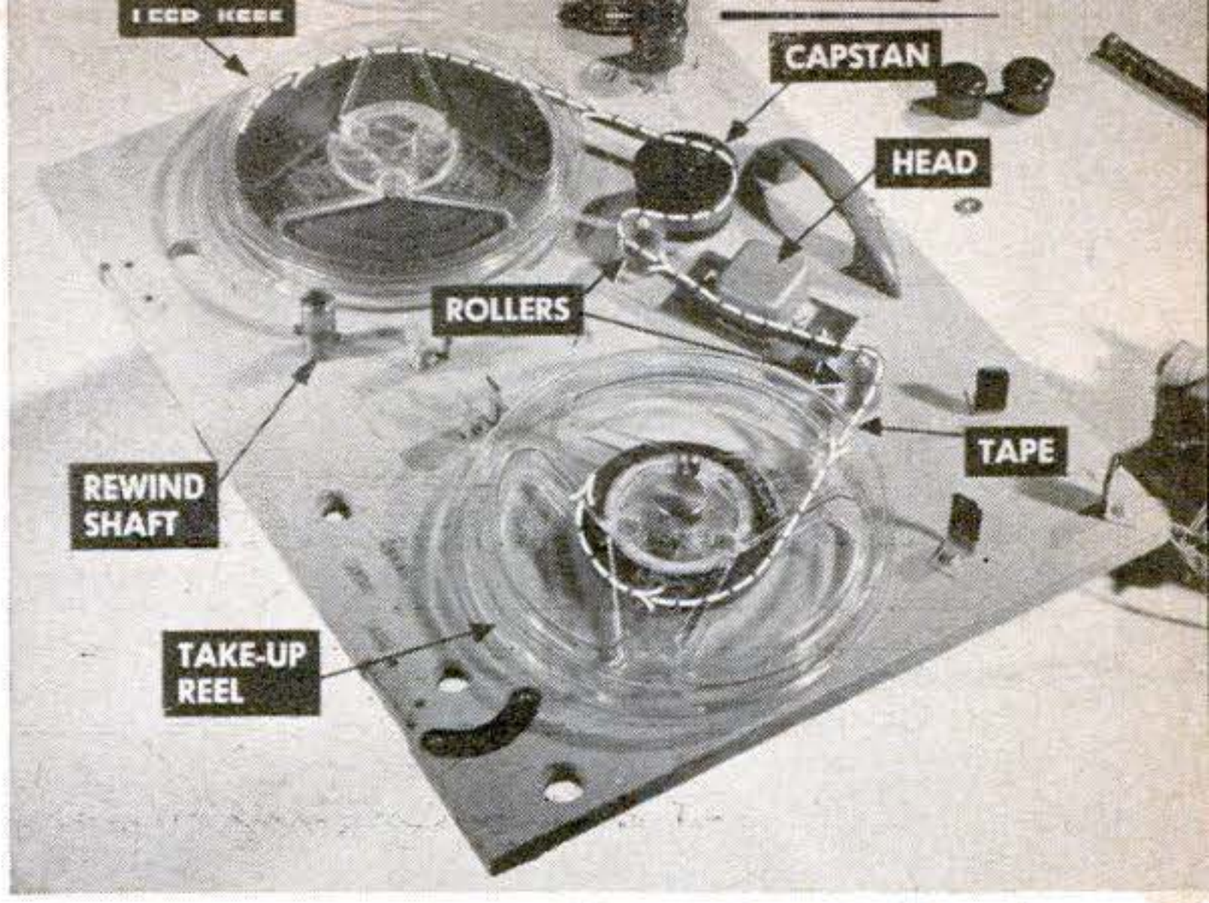
The first step was to dismantle the motor and remove the output shaft. On my motor it was only necessary to take off one end plate to slip out this shaft with its gear. Then I chucked it true and turned three steps on the upper end. A 5/16″ diameter as near the bearing as possible takes the flywheel. A ¼″ diameter receives the belt pulley, and the capstan end is 7/32″.

A flywheel proved indispensable to keep the tape running at a constant speed. The original mounting holes in the motor frame did not leave room for one, so I drilled and tapped new holes, first checking to make sure they wouldn't interfere with something else. The flywheel was built up on a solid-brass gear by riveting on lead disks and then turning the assembly true. If space permits, make the flywheel at least 5″ in diameter.

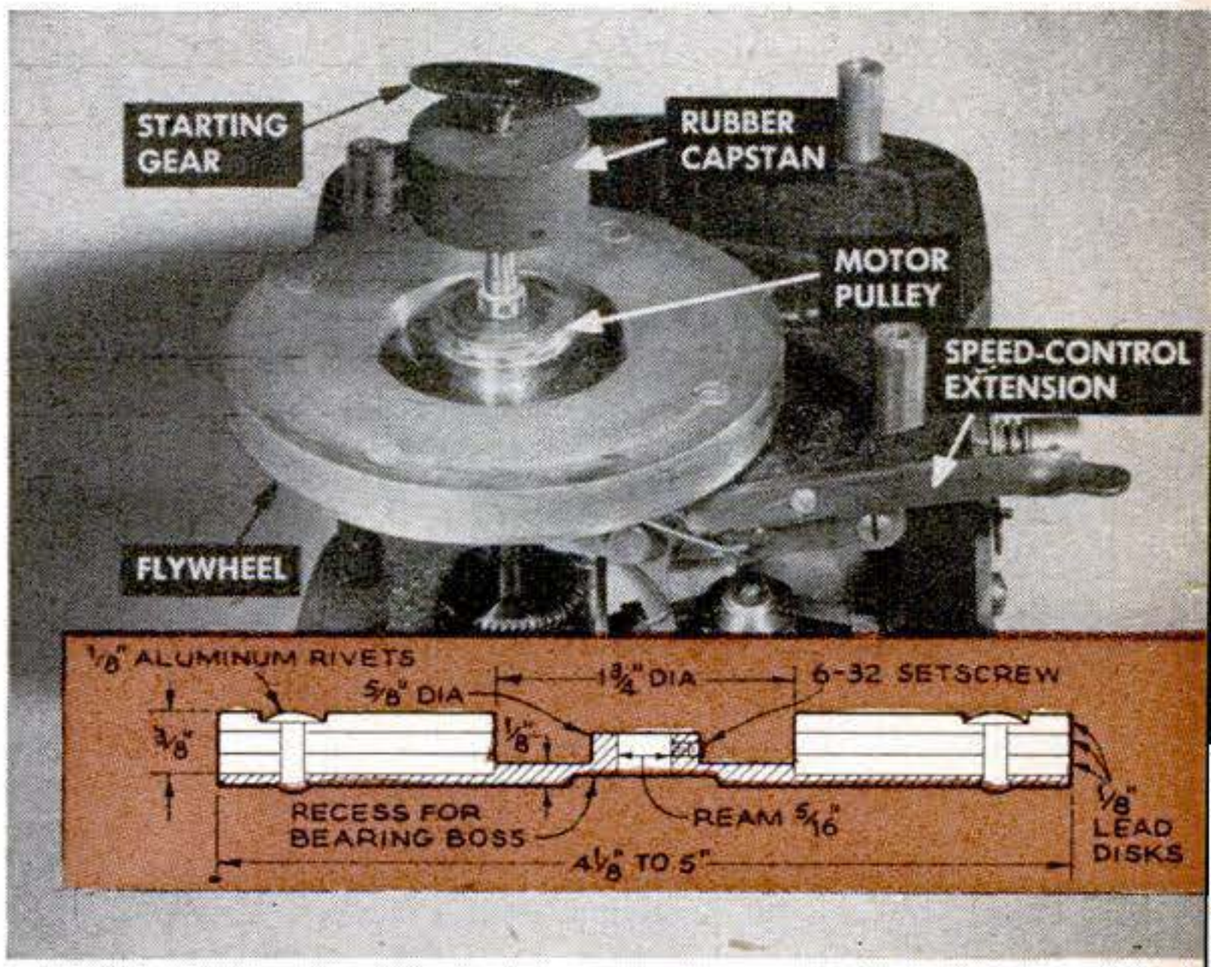
An extension arm was soldered to the governor control, and a speed regulator from an old phonograph was mounted on the panel to work the arm. A simple stop working on the flywheel was also fitted.

No crank came with my motor, so I made one up as shown in the drawings. The extra notch catches the pin in the rewind shaft, which must be turned counterclockwise.

The capstan. Capstan drive insures uniform tape speed whether the take-up

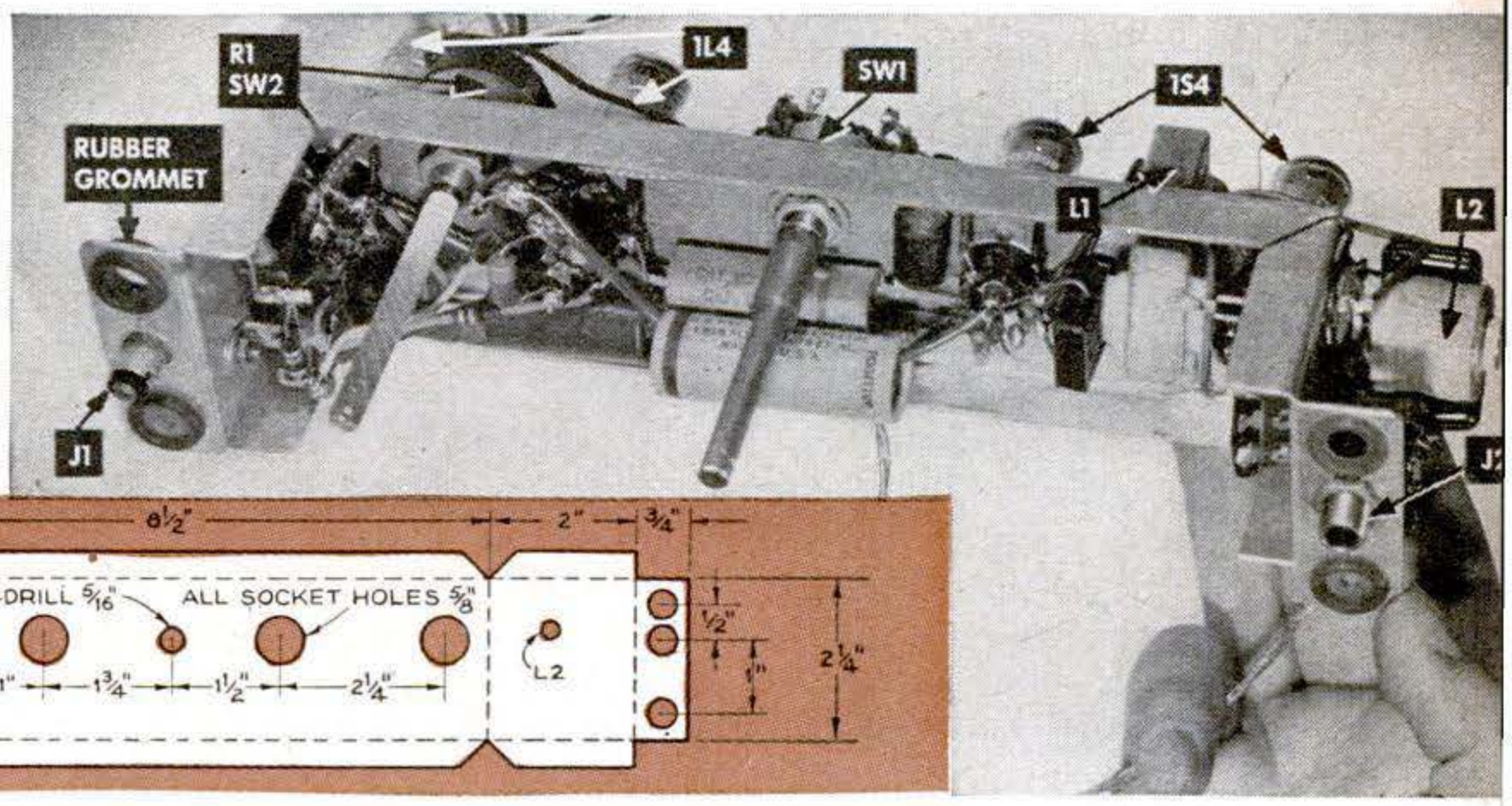


HOW TAPE IS THREADED. The oxide (dull) side must touch the recording head. Tape winds on the reels with this side out; if purchased with the shiny side out, simply rewind it. The clips at right-hand corner above hold the mike. Those between the reels are for the crank. Use light oil on reel and roller shafts.



HEAVY FLYWHEEL is a must for smooth tape travel. The one shown above is minimum in size and weight; use a bigger one if space permits. Gear on top of rubber capstan is twirled to give heavy flywheel a quick start.

STRIP CHASSIS is laid out on 1/16″ aluminum, drilled, and bent up as shown. It is mounted upside down behind the motor. Wood screws with tiny washers on them run through the rubber grommets.



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reel is full or nearly empty. The capstan is a friction wheel which moves the tape along by direct contact, pulling it off the free-turning feed reel. The take-up reel is belt-driven to pick up tape as fast as the capstan runs it through.

My capstan started out as a No. 8 one-hole rubber stopper bought at a drugstore. I first cut down the taper by holding it against a sanding drum. Then I forced it onto some ¼" tubing, chucked this in an electric drill, and ran it against a fine high-speed grinding wheel, which quickly produced a straight, smooth surface.

Since the motor gets the flywheel rolling rather slowly, I soldered a thin gear to the capstan retaining screw. A twist of the fingers gets the tape moving immediately.

The rollers. I turned these from an old plastic screwdriver handle I happened to have, but, being molded, this wasn't as easy to turn as extruded Catalin or Bakelite would be. Each roller spins freely on a piece of small tubing.

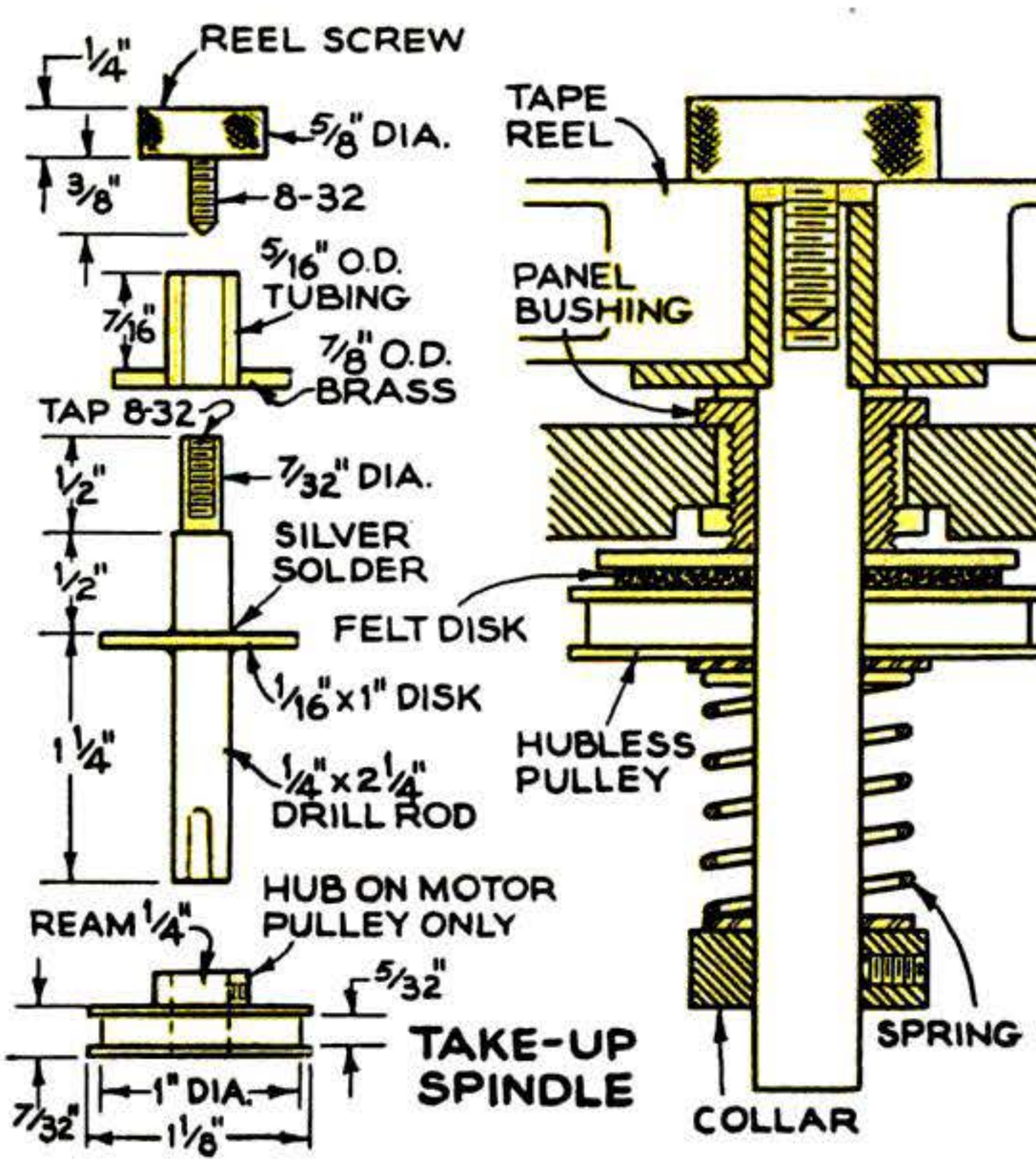
The head. This was purchased, and has one winding for recording and playback and a second winding for the erasing current. It was mounted with 2-56 screws on a small piece of Bakelite. This was fixed on the panel with wood screws in slots, which permit adjustment.

The reel spindles. Both reel spindles were made by soldering brass tubing into large brass washers. These were faced true in the lathe, and the spindles pressed onto the shafts. For bearings I used panel bushings to take ¼" drill rod. My drill stock was slightly oversize so I had to ream out the bushings for a good fit.

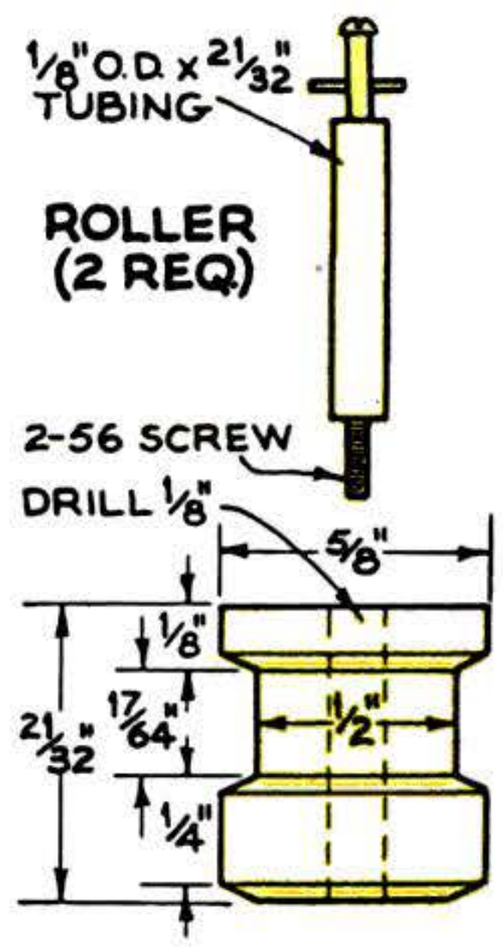
The feed-reel shaft has a small spur gear on it, which an idler gear links to a large gear on the rewind shaft. The ratio should be at least 5 to 1. Use an idler of any convenient size; it does not affect the ratio.

To make the tape hug the capstan, the feed reel must drag a bit. This was achieved by cementing a felt disk underneath the reel seat and a leather disk to the panel below.

The take-up reel. Since the hub of the take-up reel is larger than the capstan, it keeps trying to wind in the tape faster than the capstan delivers it and there is never any slack. But to keep the reel from pulling the tape too fast, it must be driven by a clutch arrangement that permits it to slip. A pulley, belt-driven from the capstan shaft, turns freely on the take-up shaft but is pressed up against a second disk on the



shaft by a spring. This clutch disk was silver-soldered to the shaft and faced dead true. Between it and the pulley there is a felt disk into which powdered graphite was rubbed. Spring tension can be adjusted by moving the collar.



Adjustments. Motor and take-up shafts on my recorder are 5 9/16" apart. This proved just right for a standard dial belt, but it would be a good idea to mount one or the other in slots to permit adjustment.

The head and rollers were set so that the tape cleared the upper edge of the head housing by 1/64" and wound up evenly in the reels. Tape must run across the head with the oxide (dull) side in, which means it must be wound on the reel oxide side out.

By flipping over and interchanging the two reels you record on the opposite edge.

The amplifier. To simplify the circuit and reduce battery drain, I omitted the equalizing networks embodied in commercial recorders to gain quality. As built, the amplifier is adequate for voice, but won't do anything for Beethoven's Fifth.

Only the main chassis holes are shown on the drawing. Extra ones are needed for

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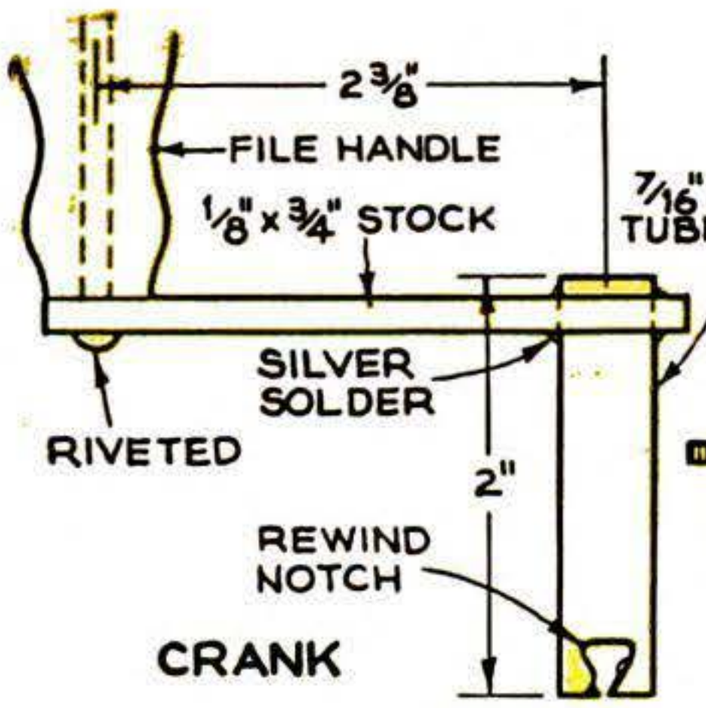

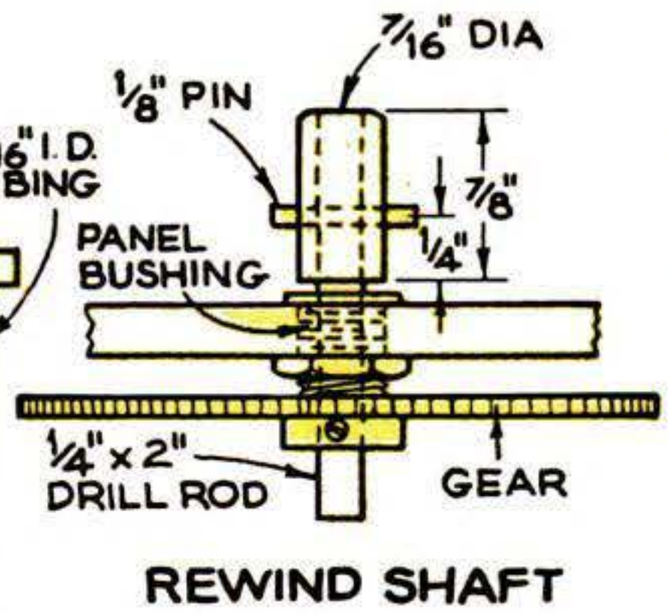

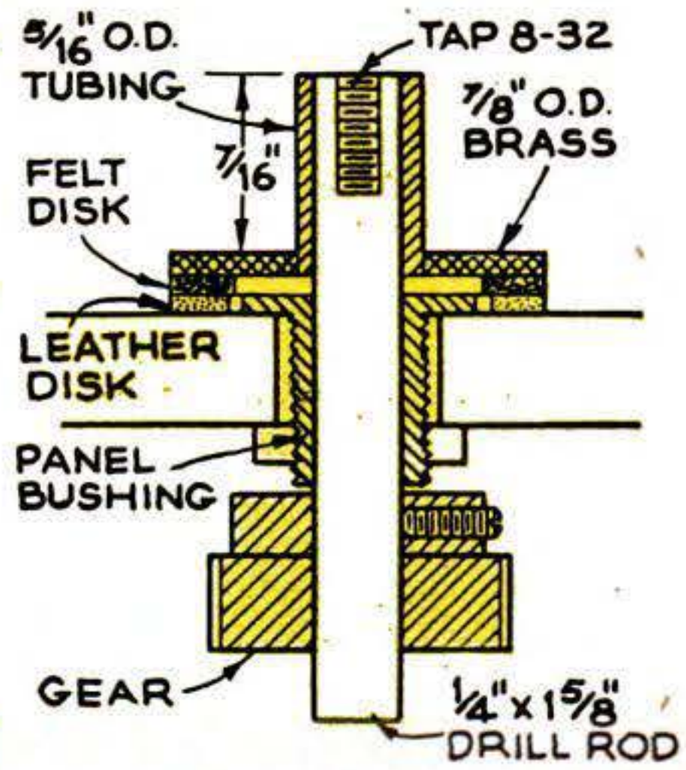

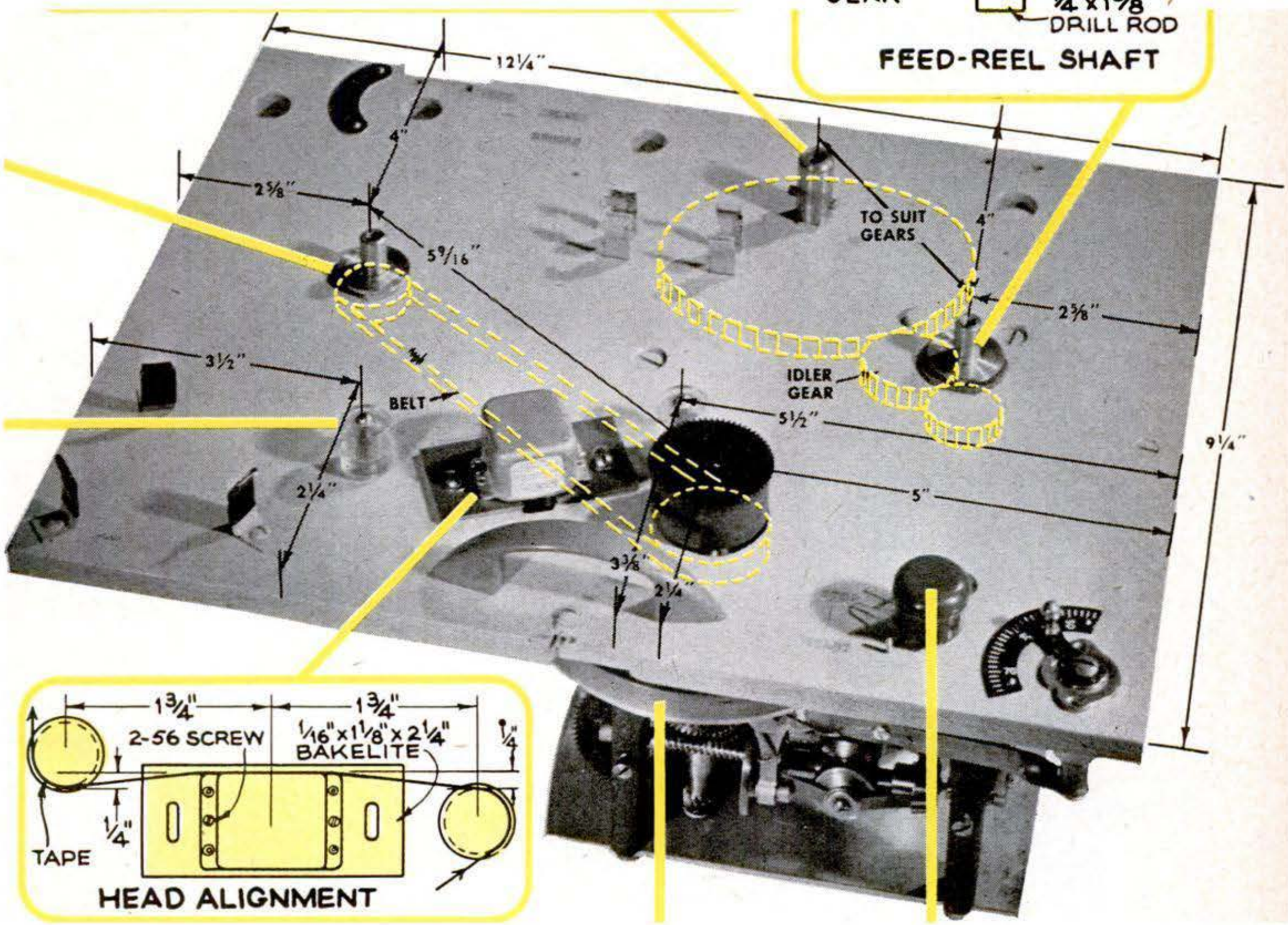

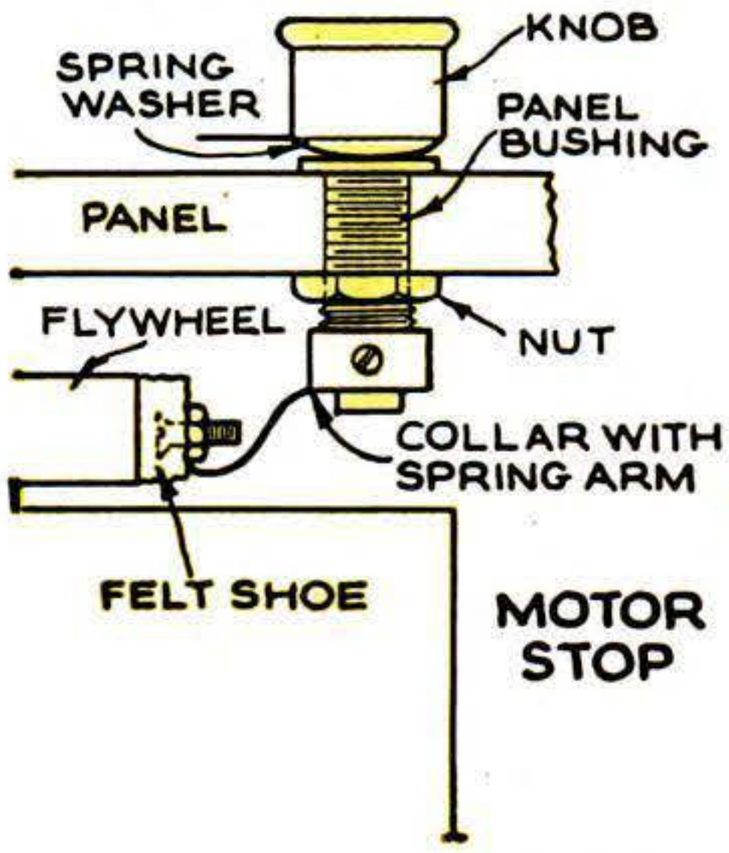

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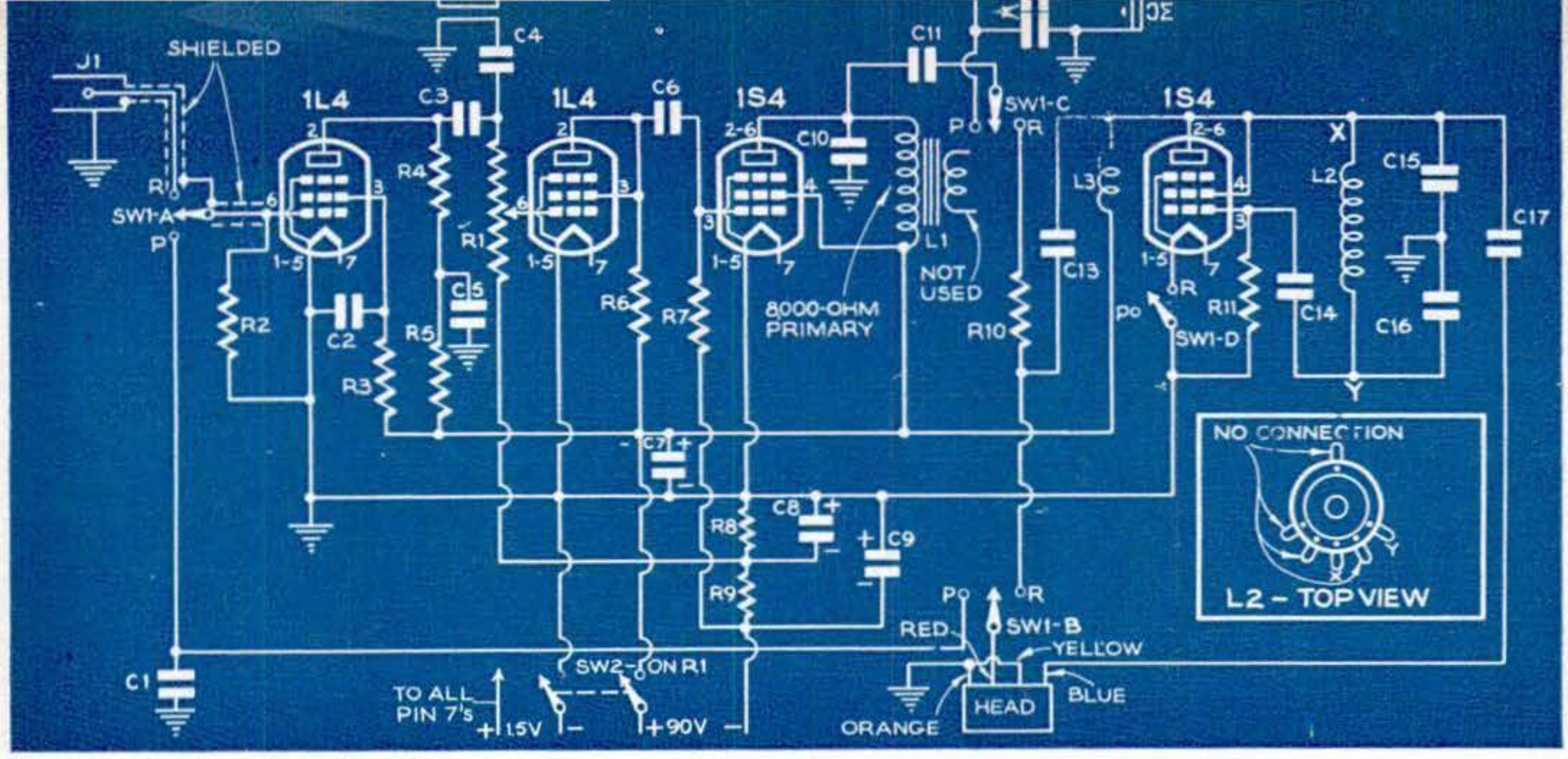
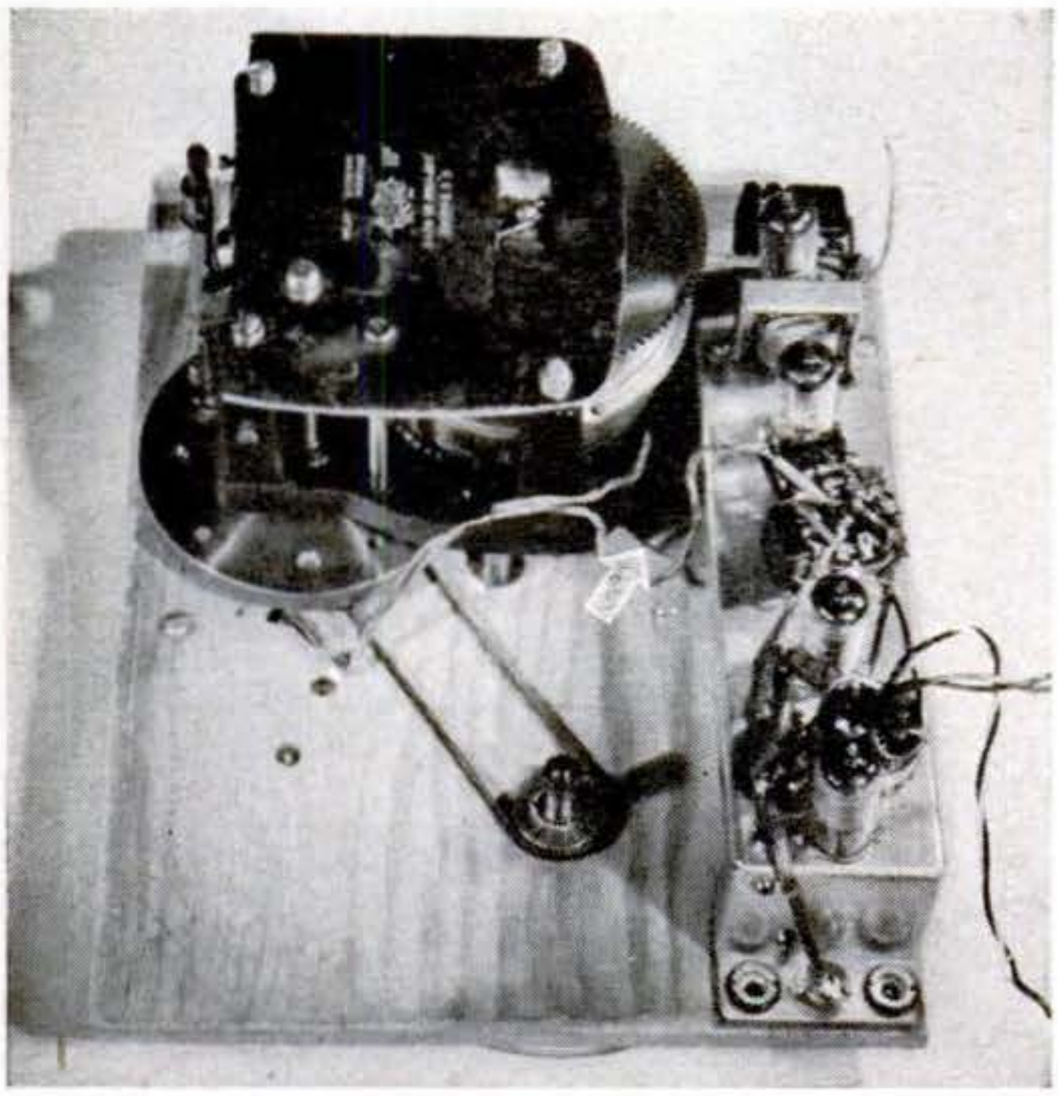


LIST OF PARTS

C1, C14: .01 mfd.
C2, C5, C11: .25 mfd.
C3, C6: .05 mfd.
C4: 100 mmf.
C7: 10-mfd., 150-volt electrolytic.
C8, C9: 50-mfd., 25-volt electrolytic.
C10: .002 mfd.
C12, C16: .005 mfd.
C13: 250 mmf.
C15, C17: .003 mfd.
R1: 1-megohm potentiometer with DPST switch SW2.
R2, R3: 2-megohm carbon, ⅓ watt.
R4, R7: 1-megohm carbon, ⅓ watt.
R5, R11: 75,000-ohm carbon, ⅓ watt.
R6: 100,000-ohm carbon, ⅓ watt.
R8: 100-ohm carbon, ⅓ watt.
R9: 700-ohm carbon, ⅓ watt.
R10: 20,000-ohm carbon, ⅓ watt.
L1: Midget output transformer, 8,000 ohms to 3 ohms.
L2: Oscillator coil, Webster-Chicago 20E409.
L3: 80-mh. choke, iron core, unshielded.
Head: Shure No. 815.
J1: microphone jack and plug.
J2: Single-circuit phone jack.
4 miniature 7-pin sockets.
4 panel bushings.
Dial belt: G-C No. 186 or J.F.D. No 47.
Motor: Heavy-duty double-spring Garrard.
Microphone: Shure replacement cartridge.
2 45-volt B batteries.
1 1½-volt A battery.
1 empty 5" tape reel.
Hook-up wire, bolts, nuts, etc.

mounting sockets and passing wires through.

Switch SW1 is a four-pole, double-throw rotary type. For sections A (input) and B (head) I used switch points opposite each other. All four sections were wired so that the points marked R were contacted by the moving blades at one time (for RECORD), those marked P for PLAYBACK.



LARGE GEAR on the rewind shaft (arrow) lies between panel and amplifier chassis. Drive belt should be just taut; if the sides cannot easily be brought together with fingers, tension is excessive and will overload motor. If belt slips, apply radio dial-cord dressing.

The oscillator coil has five terminals on it, but only two (to the high-impedance winding) were actually used. I removed the outside coil and used the other lugs as convenient tie points. The choke L3 is inside the chassis opposite the oscillator coil.

All condensers were the smallest available and of 150-volt rating. Mica condensers were used for C13 to C17 to reduce oscillator losses. Aside from the electrolytics, all others can be paper.

Only the primary of L1 was used, but a small speaker could be connected to the voice-coil side if desired.

The try-out. Total plate current proved to be 11½ milliamperes in the PLAY position and 14 in RECORD. I found a capstan speed of 60 to 75 r.p.m. satisfactory. With the motor wound, the tape is started and SW1 thrown to R. The volume control need be at only about one-quarter of maximum for recording.

After recording, stop the motor, remove the tape from the head and capstan, and rewind. If you rewind over the capstan on RECORD you'll erase what you put on.

With the switch on P, you can replace the tape and listen to it play back. Tape is erased continuously in the R position. END

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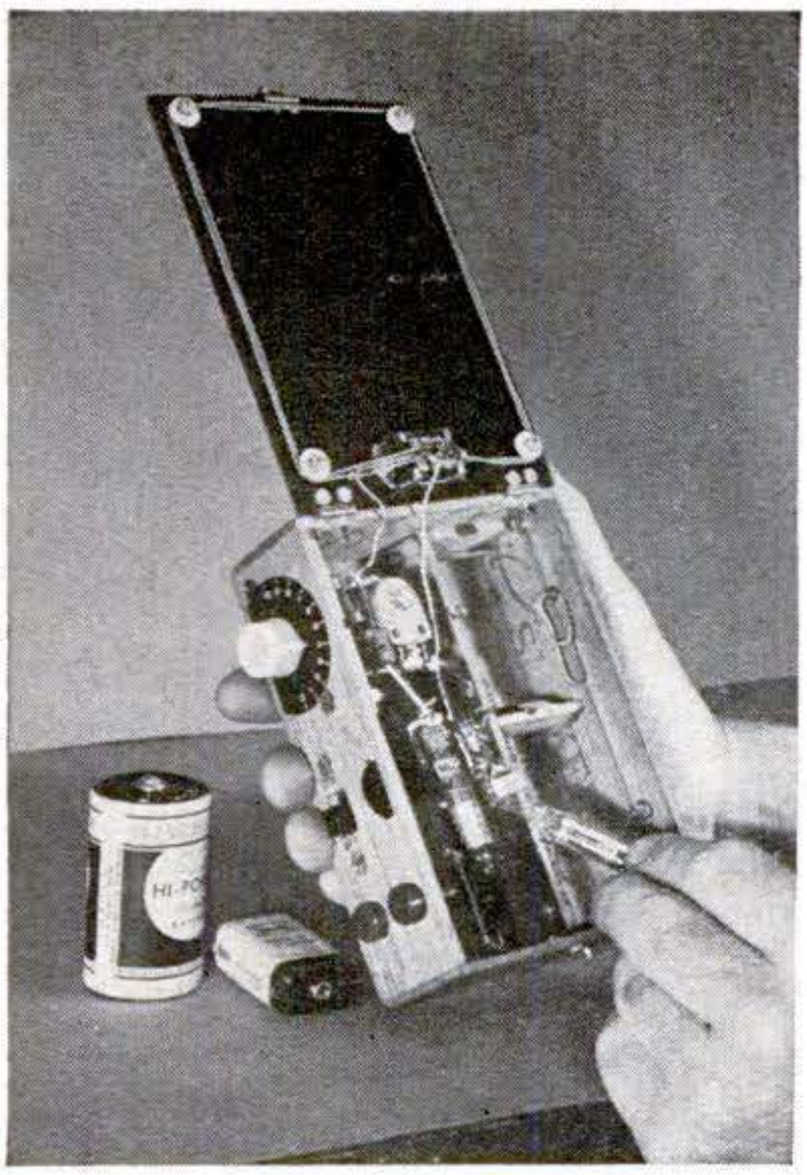
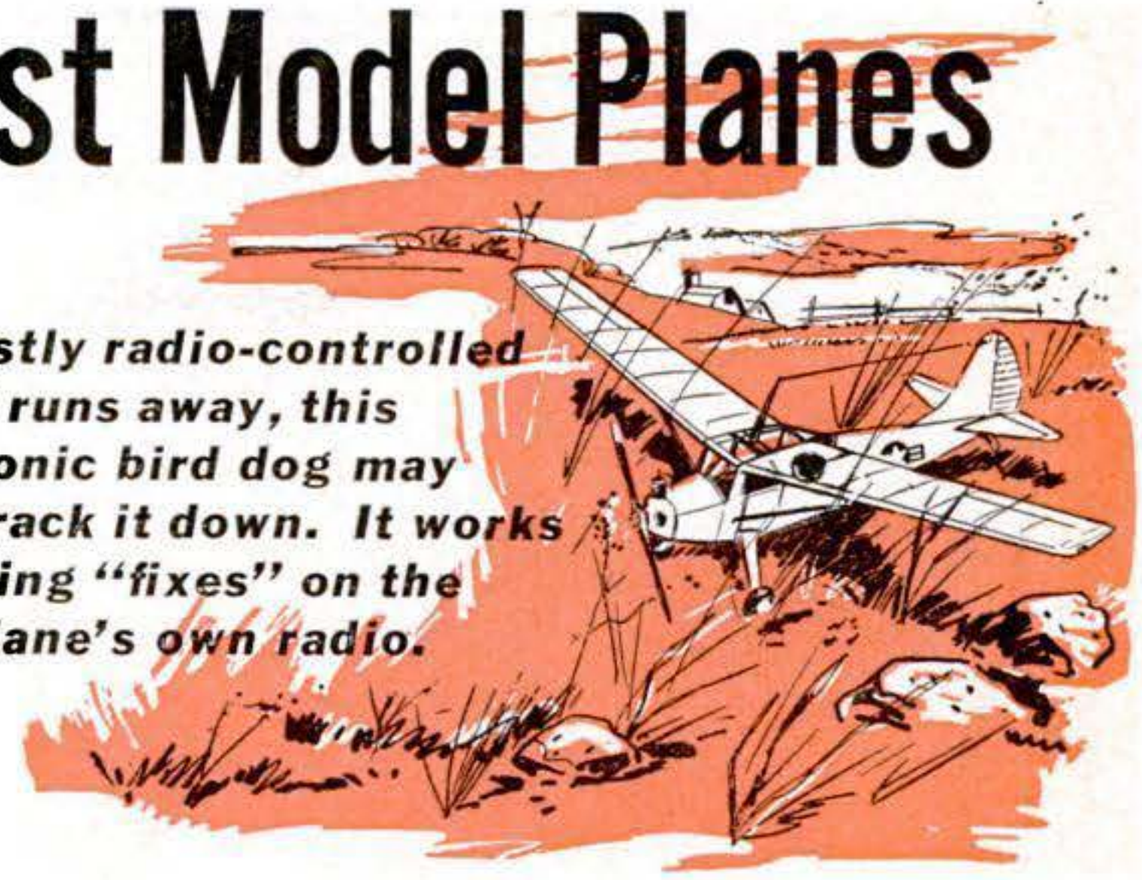


Radio Locator Finds Lost Model Planes



If a costly radio-controlled model runs away, this electronic bird dog may help track it down. It works by giving "fixes" on the lost plane's own radio.

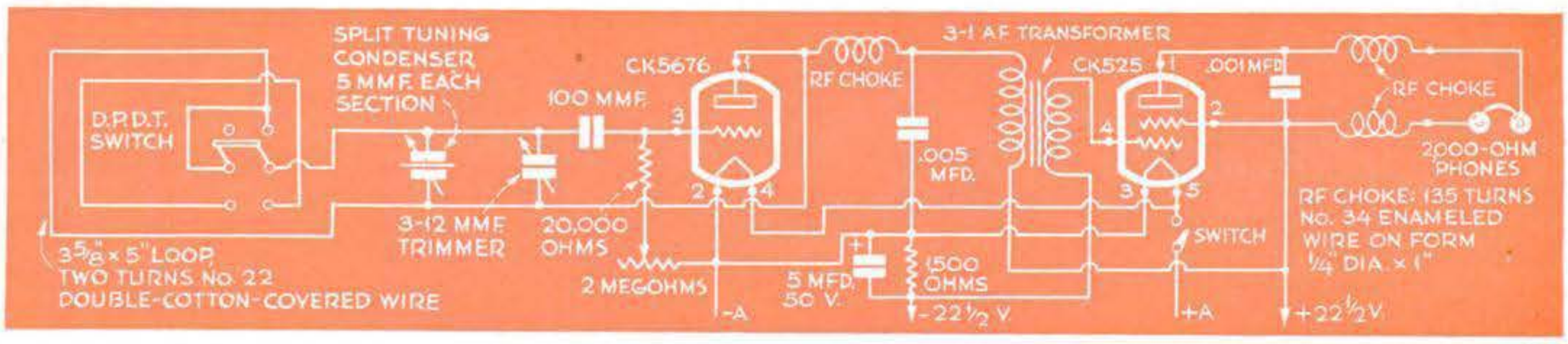
WHEN you lose control of a radio-guided model plane, you frequently lose the plane. If the model's rudder-operating system fails and a strong gust of wind comes along, several hundred dollars' worth of plane is likely to take wing for parts unknown.

After losing several valuable models this way, a group of New Jersey fans got an idea: if the planes are flown by radio, why couldn't they be found the same way? When a runaway comes down, there's a good chance that its shock-mounted, sturdy receiver will continue to operate for an hour or more. Like most radios, the model's receiver sends out a signal that can be detected at several hundred feet.

Radio spots signal. The Jerseyites came up with a simple two-tube receiver to pick up the lost plane's signal and a loop antenna to tell its direction. The circuit (below) will operate on either of two widely used control frequencies. The antenna loop is wound around the inside of the hinged cover (left above). Tubes, B battery and many other parts are identical to those in the model's own receiver.

How finder works. The locator is first taken to the approximate area of the plane's fall and tuned to the model's frequency. The loop is then rotated until the signal is weakest. This null point is a more accurate indication of direction than the point of strongest signal.

Taking a fix. The plane of the loop is now at right angles to the line along which the lost model lies, and the operator must walk up and down this line to tell which way to go. As he walks away from the plane, the signal gets weaker; toward the plane, it gets stronger. One fix may be enough, but will show only direction. To tell how far away the plane is, several fixes are often taken from different points (sketch). The point where all lines converge shows the exact position of the plane.—*Howard G. McEntee.*



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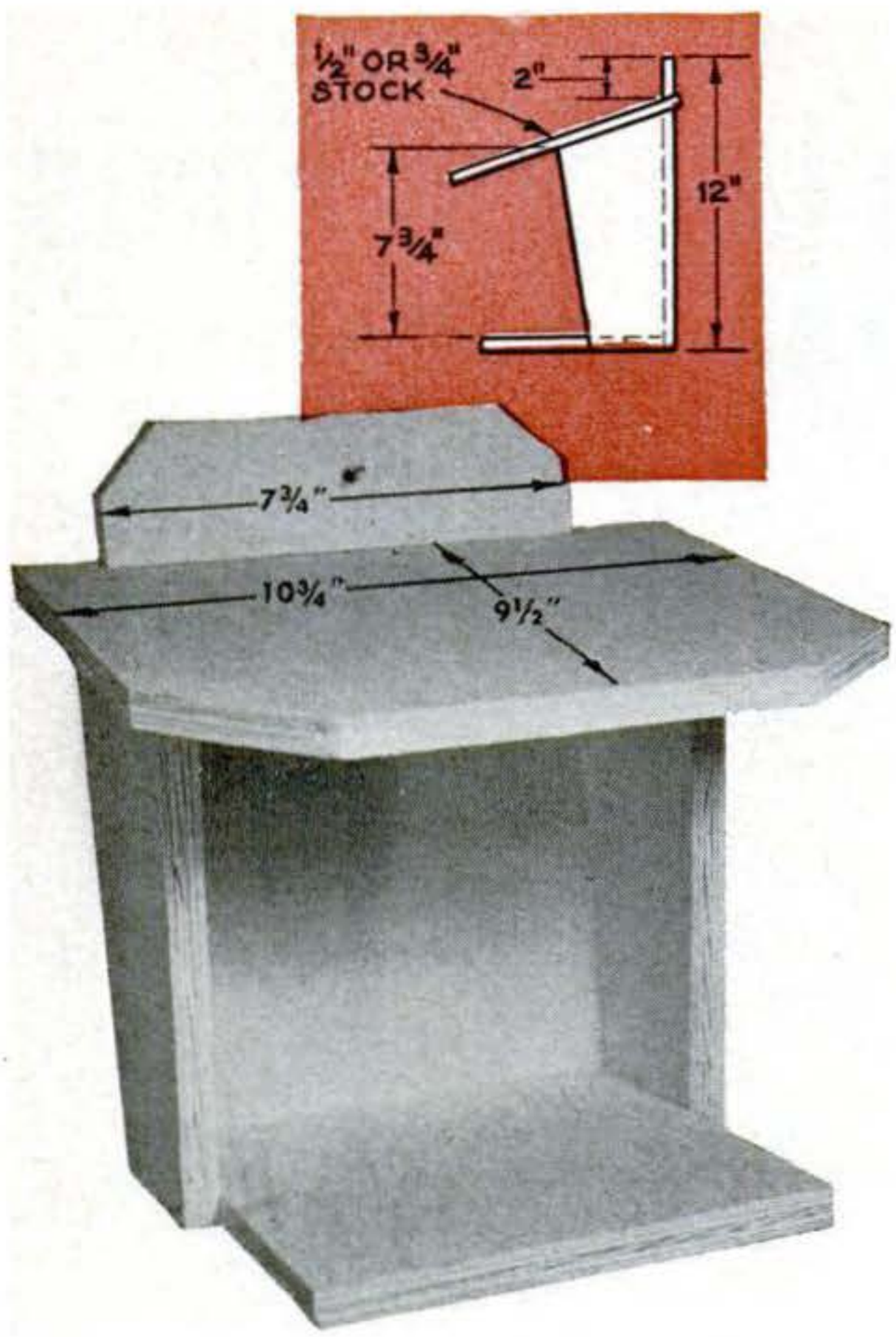
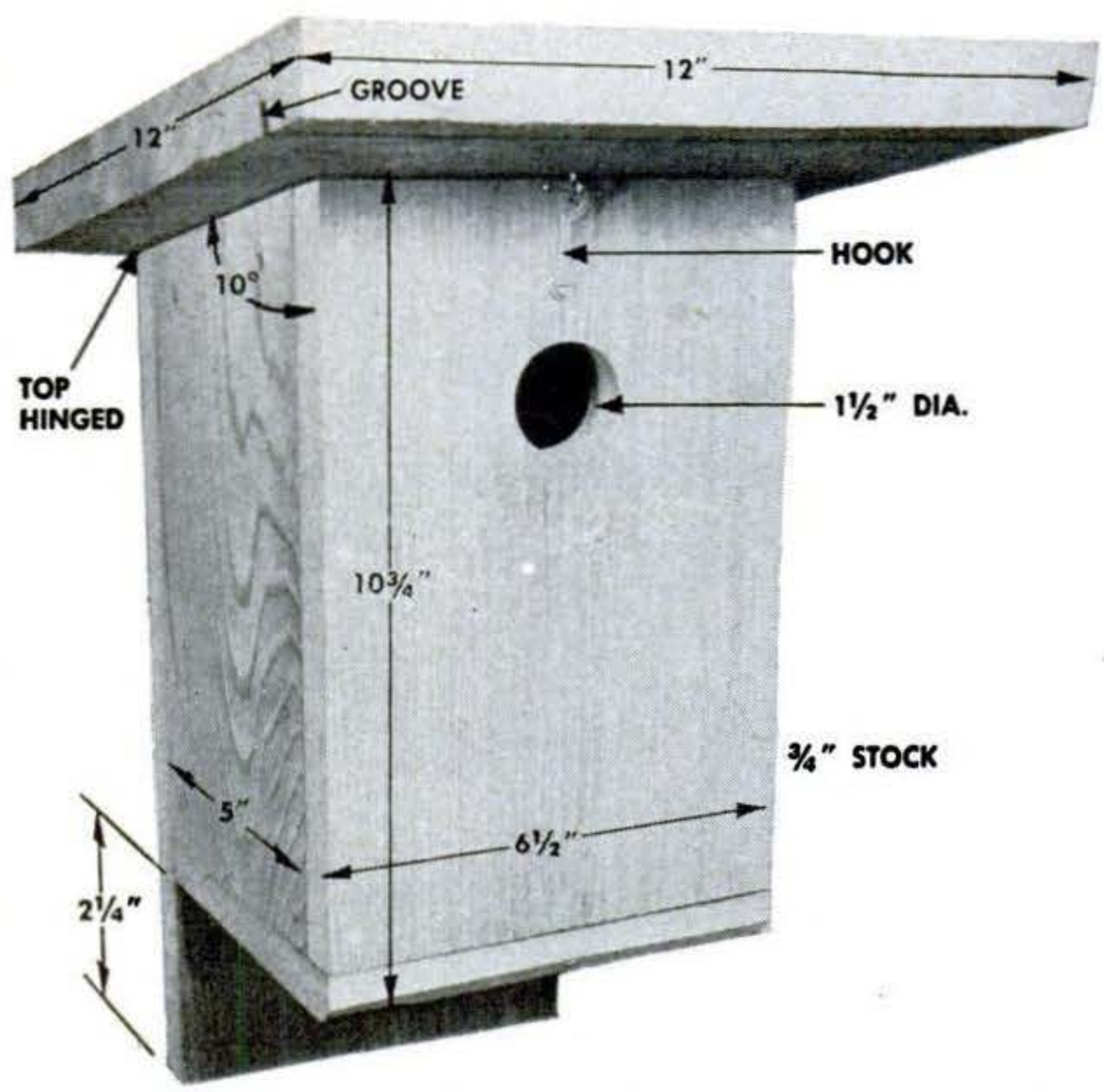


Robin. Open shelters like this will attract robins, phoebes, brown thrashers and catbirds. They won't go into houses.

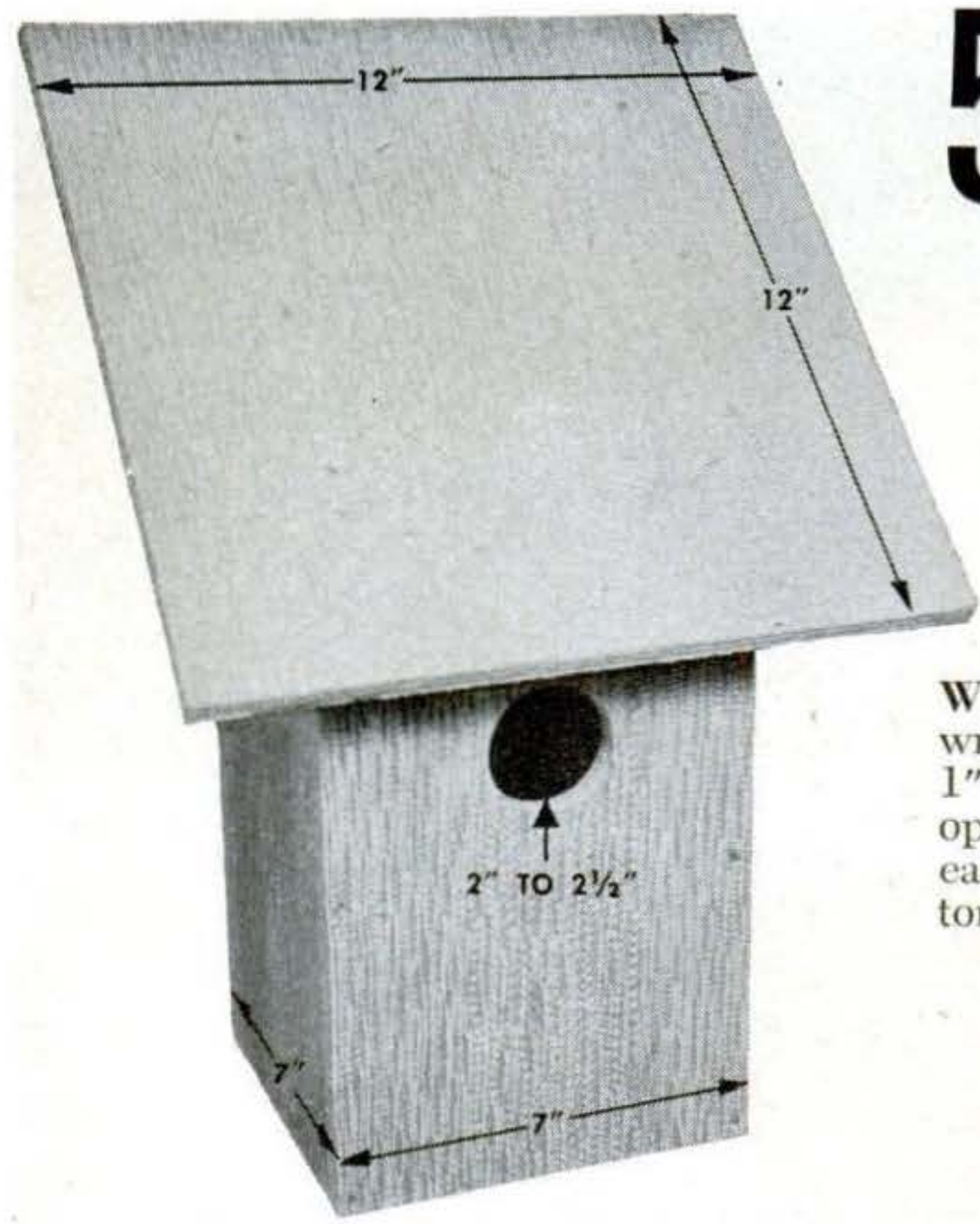


Bluebird. Depending on where you live, a bluebird or swallow may take to this house. The 2¼" tail below the house can be used for mounting it. Groove sawed under forward surface of the top keeps rain from seeping in.

Time-Tested Examples of

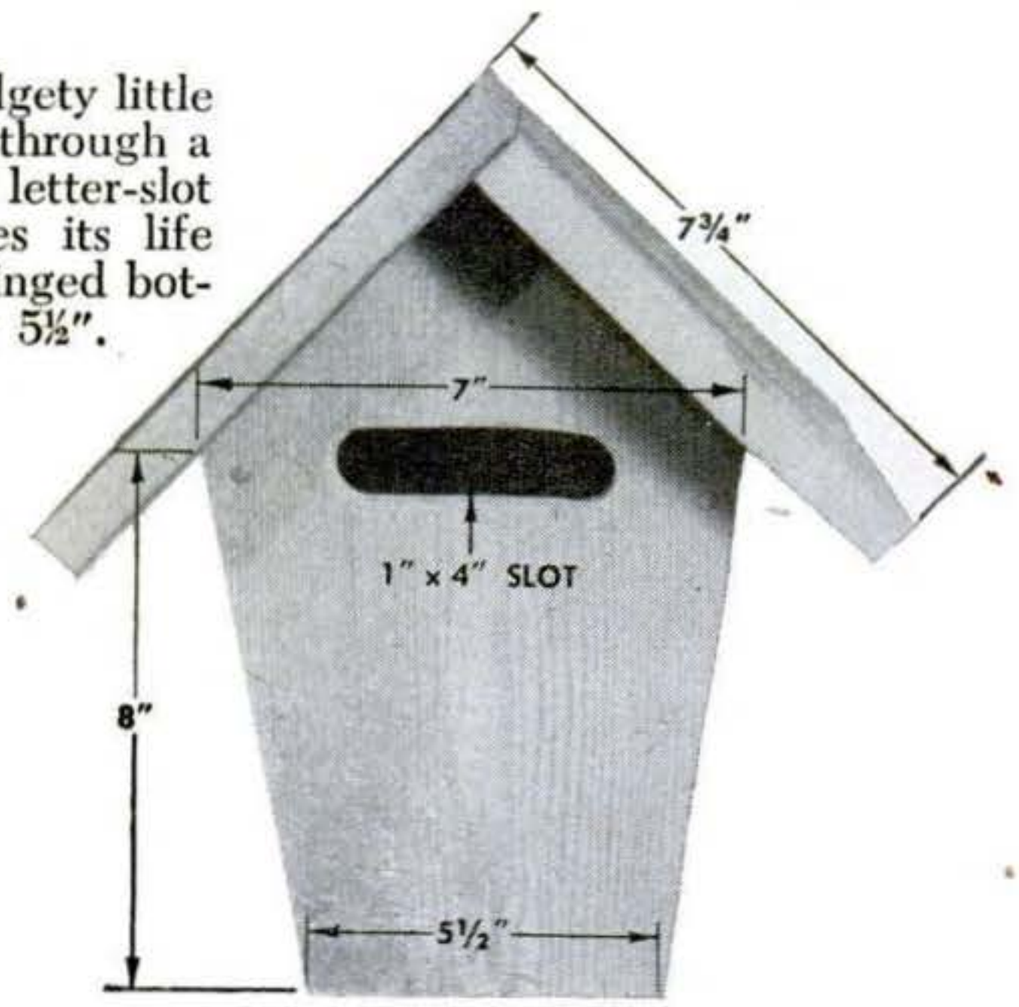
5 Basic Birdhouses

By Jerry Parker



Woodpecker. A large woodpecker, flicker, flycatcher or owl will use a house of this type. Slant top forward at 45°. Vary the depth of the box according to the type of bird you want to attract. This one was made of scraps of new plywood called embossed Rezon. It has crinkly surface resembling bark.

Wren. The fidgety little wren can get through a 1" hole, but a letter-slot opening makes its life easier. The hinged bottom is 5½" by 5½".



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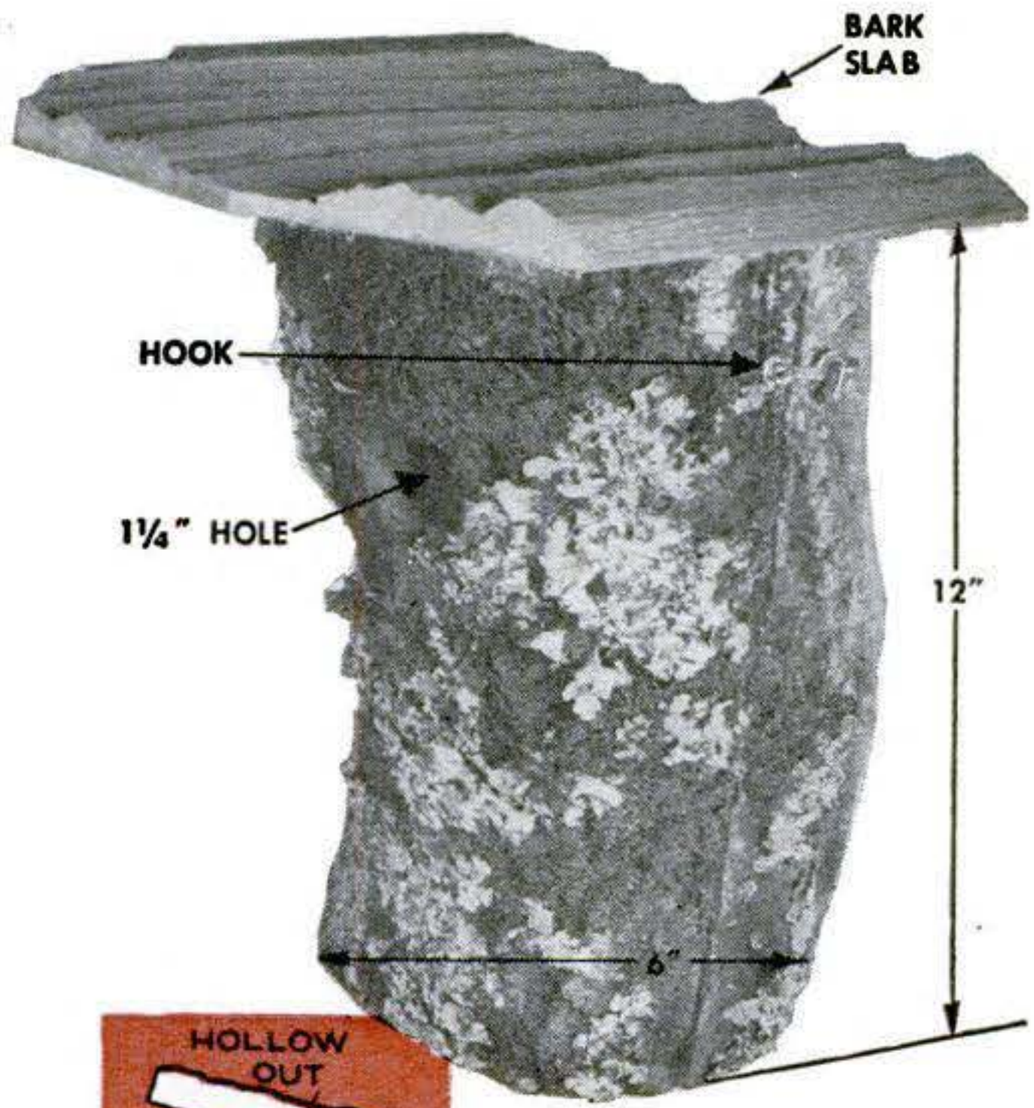

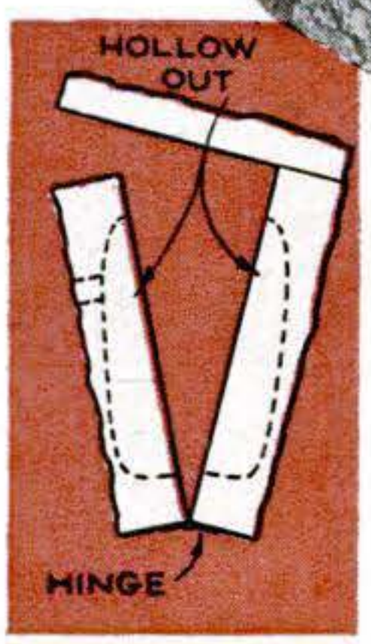

Chickadee. These birds like a log house best. The treelike exterior attracts them faster than a house built in the style of a human's because it is the sort of place that they would nest in naturally. Titmice, nuthatches and small woodpeckers also take to this type of house.

To build it, a log is halved with a ripsaw, then hollowed out, as shown in the photos on the next page. A bark-covered slab makes a perfect roof and helps make the entire house less conspicuous.

Birds prefer solid comfort to fancy architecture. Any of these designs will be home sweet home to them.

THERE'S one important rule to remember about birdhouses. Fancy structures that look like miniature cottages or bungalows are strictly for the humans. Birds don't go for them.

Keep your birdhouses simple and you'll get more tenants. Paint the house if it is not made of redwood, cedar or other material that will stand the weather. But use only dull forest colors.

Five basic designs for birdhouses have been developed over the years, each design identified with a specific group of birds. With these houses, you can give lodging to any of the 50 or so birds that take to artificial nesting sites.

The best bird homes are made from wood

BIRDHOUSES

Birds	Floor of House	Height of House	Dia. of Opening	Opening Above Floor	House Above Ground
Bluebird	5" by 5"	8"	1½"	6"	5'-10'
Robin	6" by 8"	8"	—	—	6'-15'
Chickadee	4" by 4"	8"-10"	1⅛"	6"-8"	6'-15'
Titmouse	4" by 4"	8"-10"	1¼"	6"-8"	6'-15'
Nuthatch	4" by 4"	8"-10"	1¼"	6"-8"	12'-20'
House Wren	4" by 4"	6"-8"	1"	1"-6"	6'-10'
Tree Swallow	5" by 5"	6"	1½"	1"-5"	10'-15'
Flicker	7" by 7"	16"-18"	2½"	14"-16"	6'-20'
Downy Woodpecker	4" by 4"	8"-10"	1¼"	6"-8"	6'-20'
Hairy Woodpecker	6" by 6"	12"-15"	1½"	9"-12"	12'-20'

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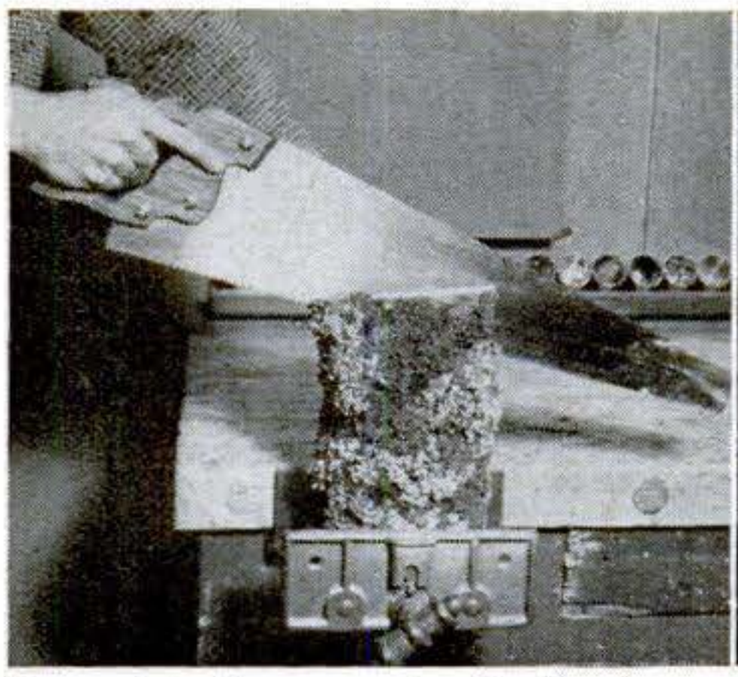
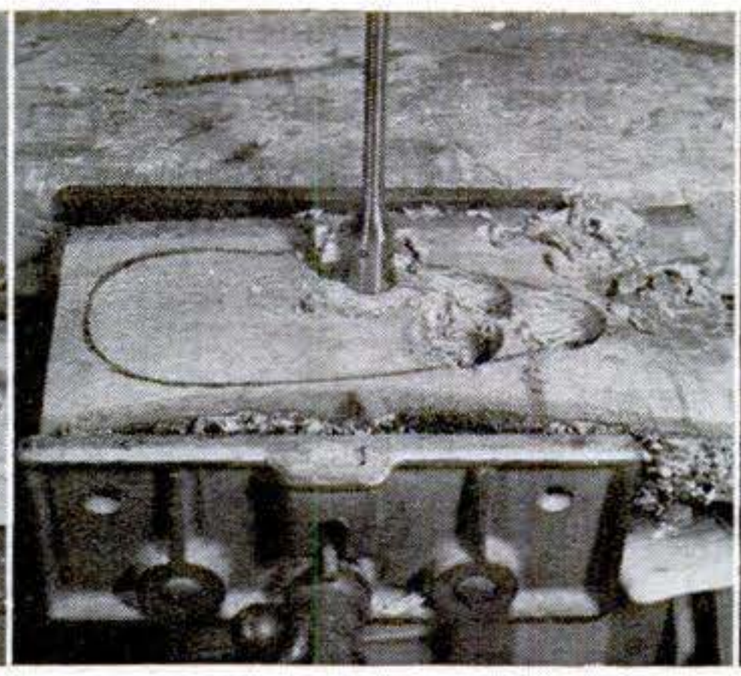


Log birdhouse is built by sawing a small piece of tree trunk lengthwise. A log 12" long and 6" in diameter will do for most small birds. The more moss and lichens, the more birds will like the house.



Pouch-shaped opening inside log makes ideal nesting place. Lay it out 4" wide at bottom on both halves of log. Remove excess wood by boring holes with brace and bit or a drill press.

Use gouge to finish the opening. Don't worry if your work is rough. The birds won't mind. Bore an entrance hole to suit the birds you want to attract and hinge the halves at the bottom.

at least ½" thick—¾" is better. Chunks from your scrap pile will probably build all you want. The heavy, thick ends of apple and orange crates also are fine material. If you live near a sawmill, you probably can get slabs of wood with the bark on. These are perfect.

All birdhouses should have a hinged section, usually the bottom or top, so the old nest can be removed and the box cleaned. A spray of five-percent DDT solution will clean them up for the next tenants. Use brass hinges to avoid rust, and close the hinged part with a brass hook and eye.

A birdhouse can be mounted on a tree or post or fastened to the side of a building. Locate the house so that the opening is away from prevailing winds. Don't bother with a perch below the opening. A perch just makes life easier for cats and other predators. To foil them, a flaring sheet-metal guard can be placed below the nest.

in MARCH for power failure.

One break in your line can cause your power to go off, and the last ice storm of winter or the first windstorm of spring can cause the break.

IF YOU are prepared, power failure will be no more than an inconvenience. **For lights, keep a supply of candles, kerosene lamps, kerosene, matches, flashlights and/or a battery lantern. Heat can be had by operating a gas furnace manually (ask your utility company how to right now if you don't know); by improvising a grate in certain oil or convertible furnaces and burning wood, coal or cannel coal; by running the kitchen-range oven with the door open (don't leave it on while you sleep), or by using a small, Army-type synthetic-fuel stove. Water pipes won't freeze if a faucet runs.**

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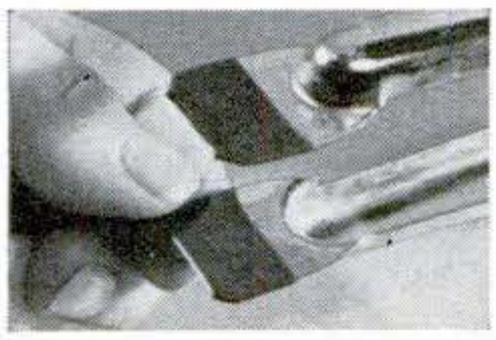
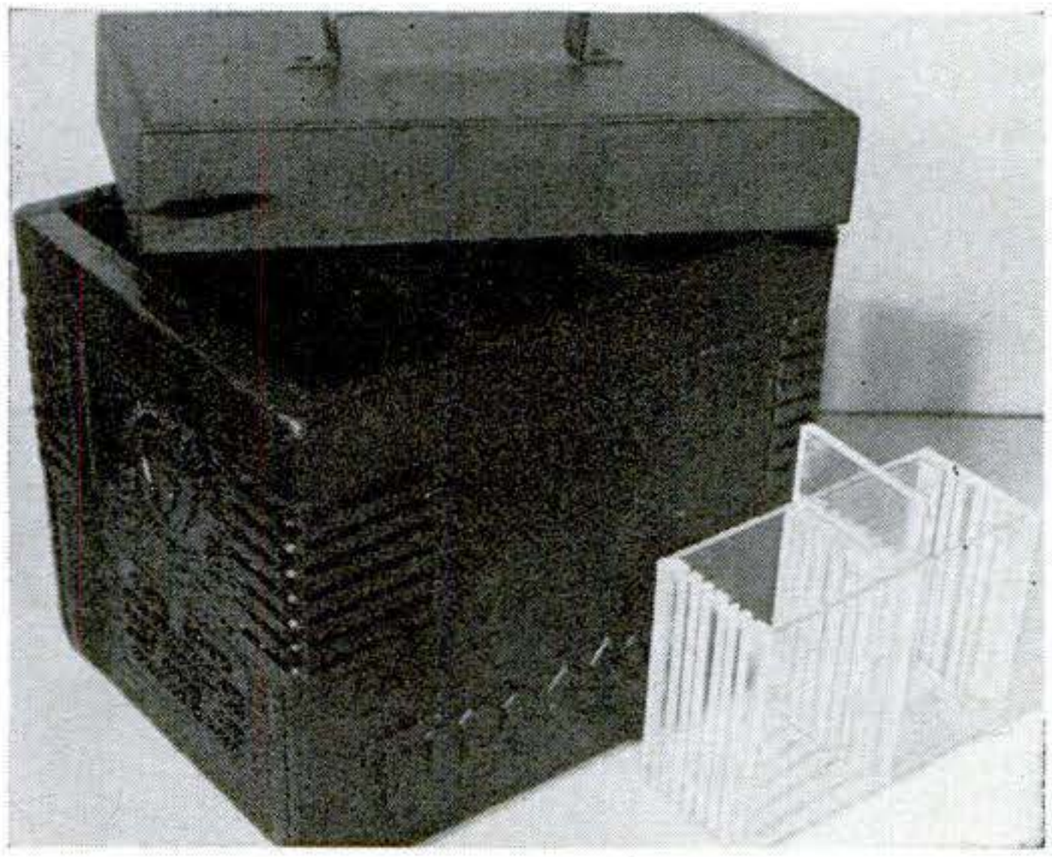
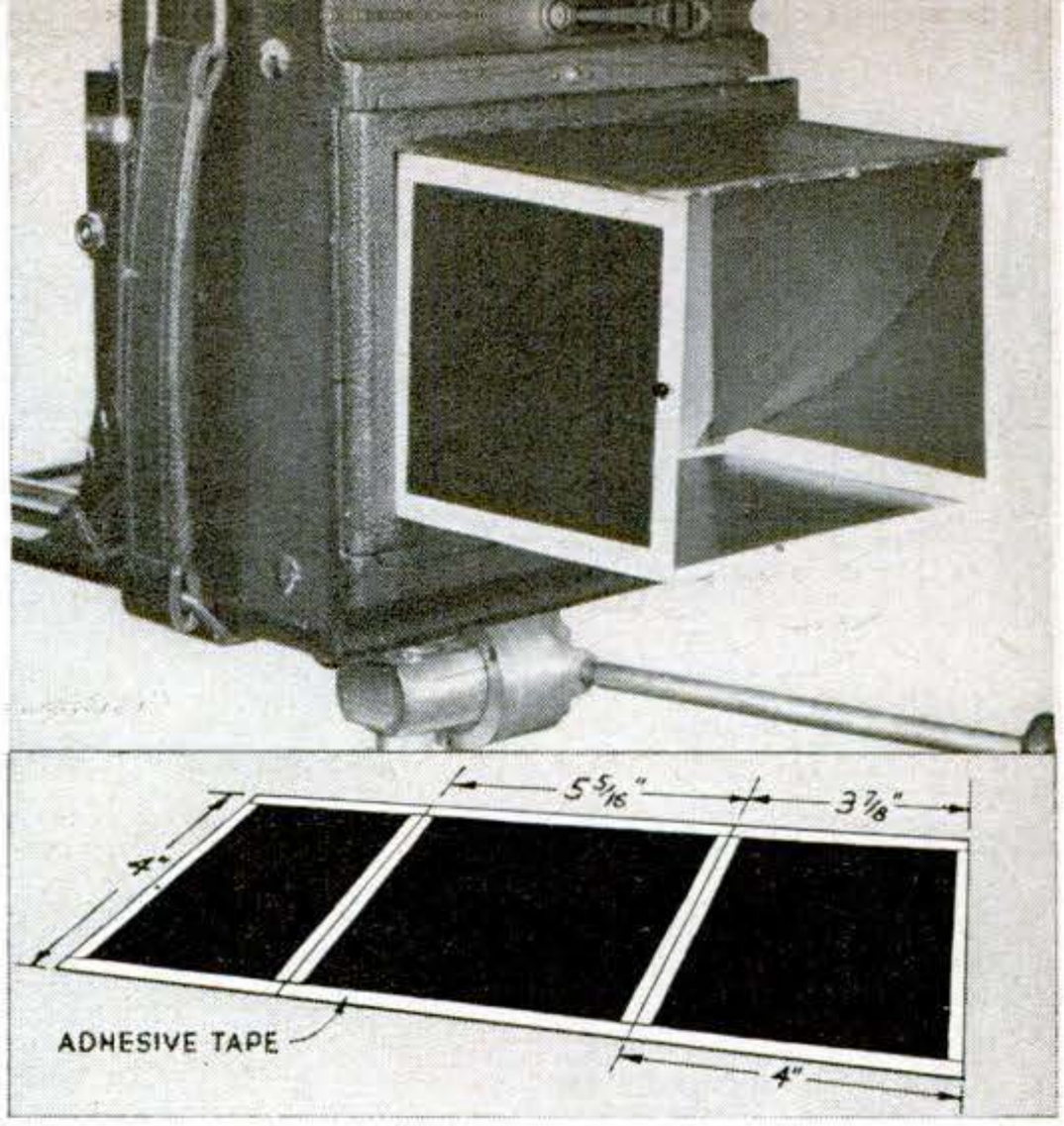
Darkroom Equipment You Can Make



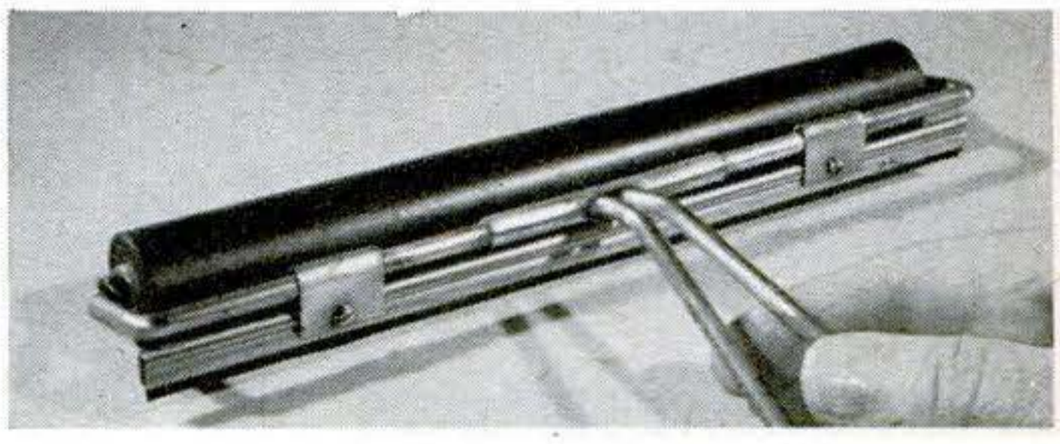
Padded Print Tongs. If the jaws of photo print tongs do not fit well and let prints slip out, cut short lengths of rubber tubing and stretch them over the ends of the tongs like this to provide a good gripping surface.



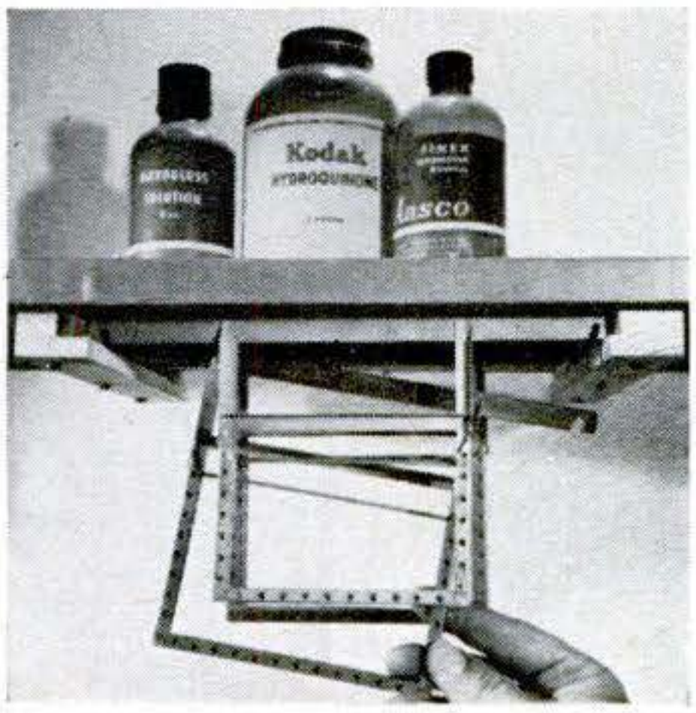
Battery Developing Tank. Battery cases make ideal developing tanks. The three divisions in this one are used for the full process—developing, stop bath and fixing. A light-tight cover made of plywood allows the room light to be on. Film is loaded into a holder (right above) made of sheets of ¼″ plastic. The end pieces were grooved ⅛″ deep on a circular saw, and the parts then cemented together with acetone. This holder takes 12 pieces of 2¼″ by 3¼″ film. Larger sheets are processed in hangers. *—Philip I. Wessling, West Roxbury, Mass.*



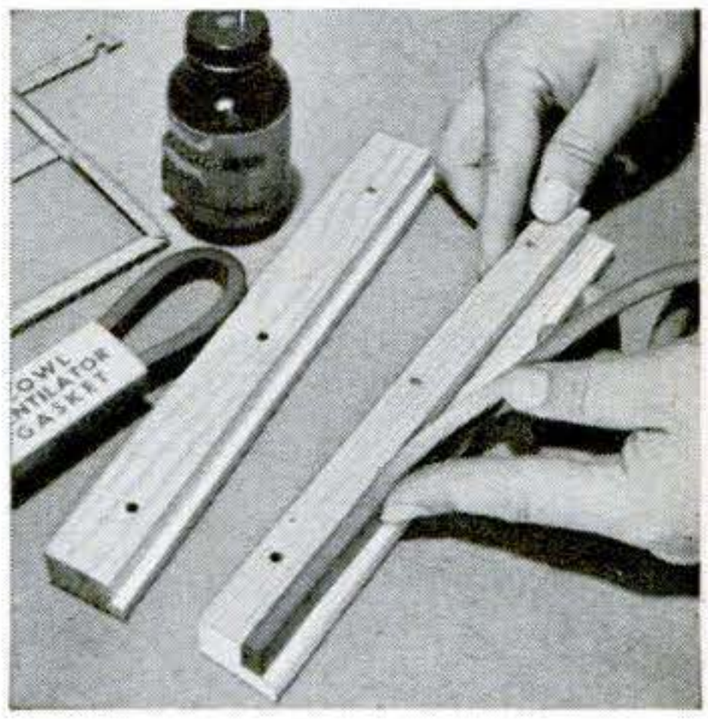
Homemade Hood Aids Focusing. Light that reflects up onto your ground glass can be minimized with this additional focusing hood. It is made from the metal film-backing sheet inside a film-pack container. Adhesive tape forms the hinges and covers the cut edges of the metal. The dimensions given in the sketch are for a 4″ by 5″ camera.*—Glenn A. Wagner, Delmar, N.Y.*



Roller Wipes Away Water, Too. Professional photographers usually use a rubber squeegee to wipe surplus water from prints on a ferrotype plate before applying a roller. Both operations can be done at once if you add a heavy windshield-wiper blade to a roller. Bolt the blade onto the handle with metal straps so that it will travel ahead of the roller.*—Ken Murray, Colon, Mich.*



Rack for Film Hangers. Any cut-film hanger can be removed from this rack without disturbing the others. Just press the end sideways into the rubber weather strip until the opposite end is free of the supporting rabbet cut in the side of the rack. A hanger can also be put back the same way.*—Louis Hochman, Sherman Oaks, Calif.*



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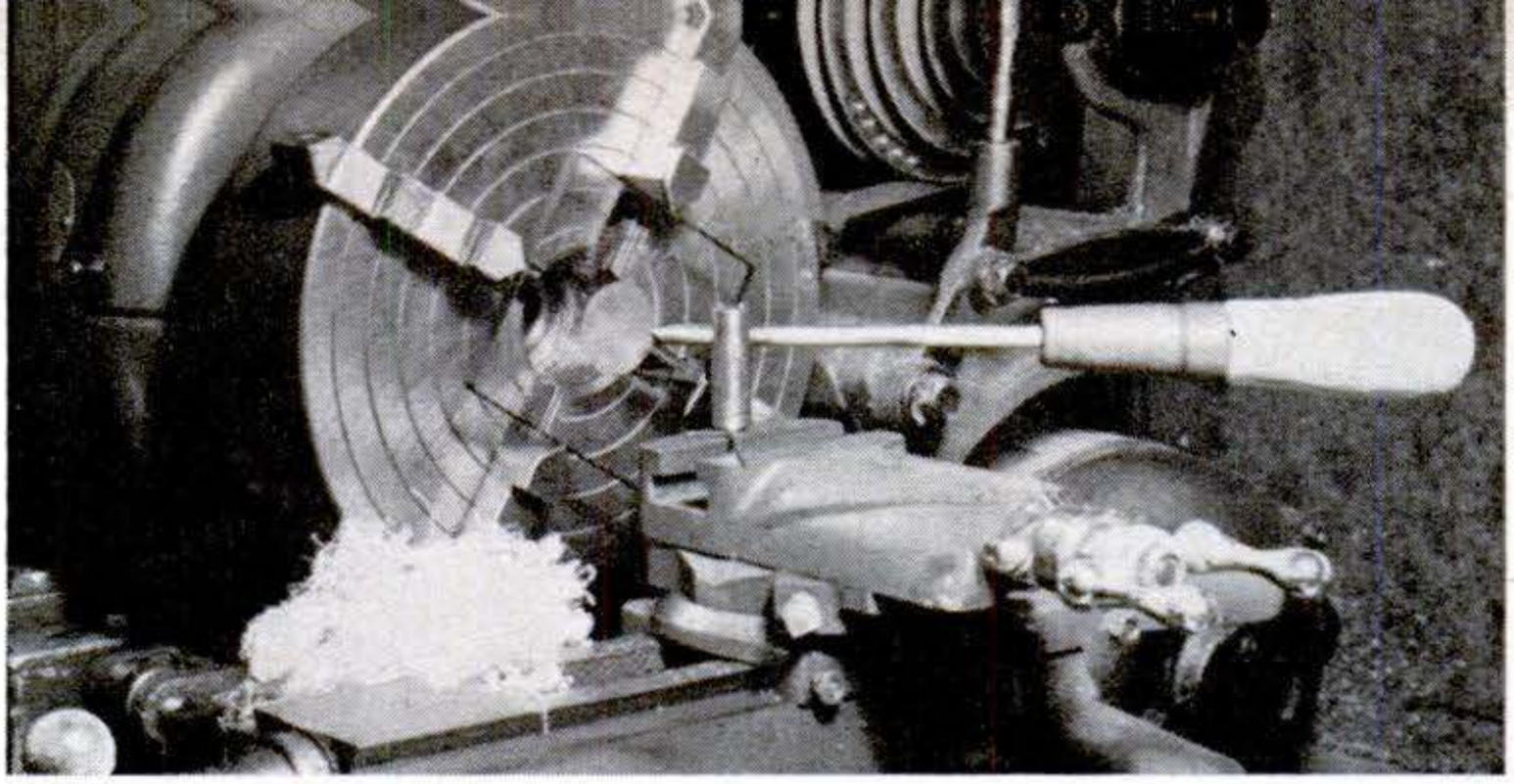
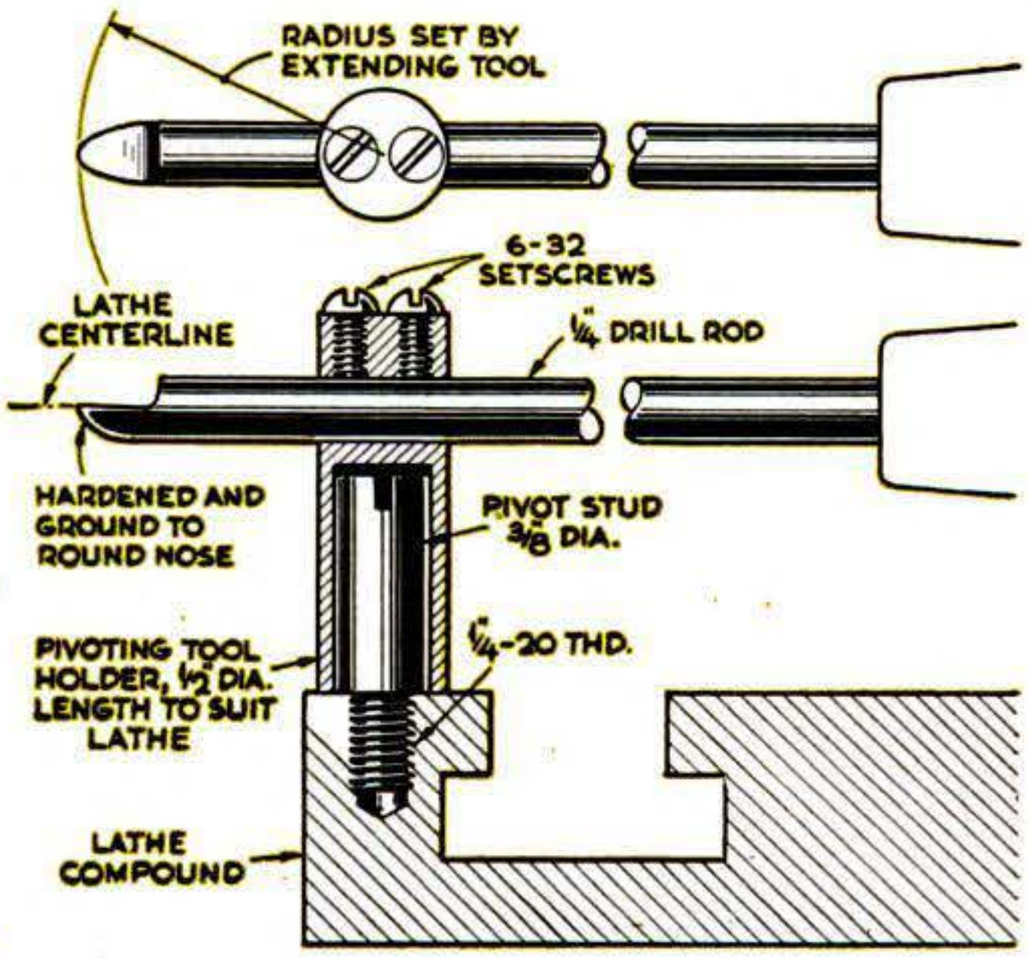
NEW Shop Ideas



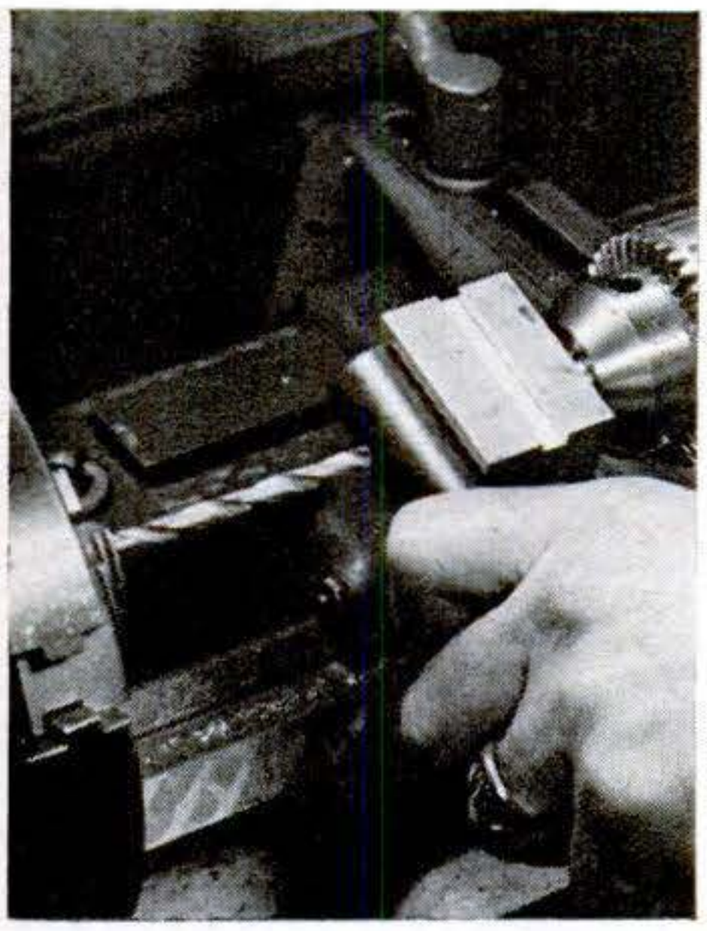
Jig Turns Inside Radius in Lathe. Turning concave depressions to any accurate radius is as easy as facing off a shaft end with the help of this inside-radius turning attachment.



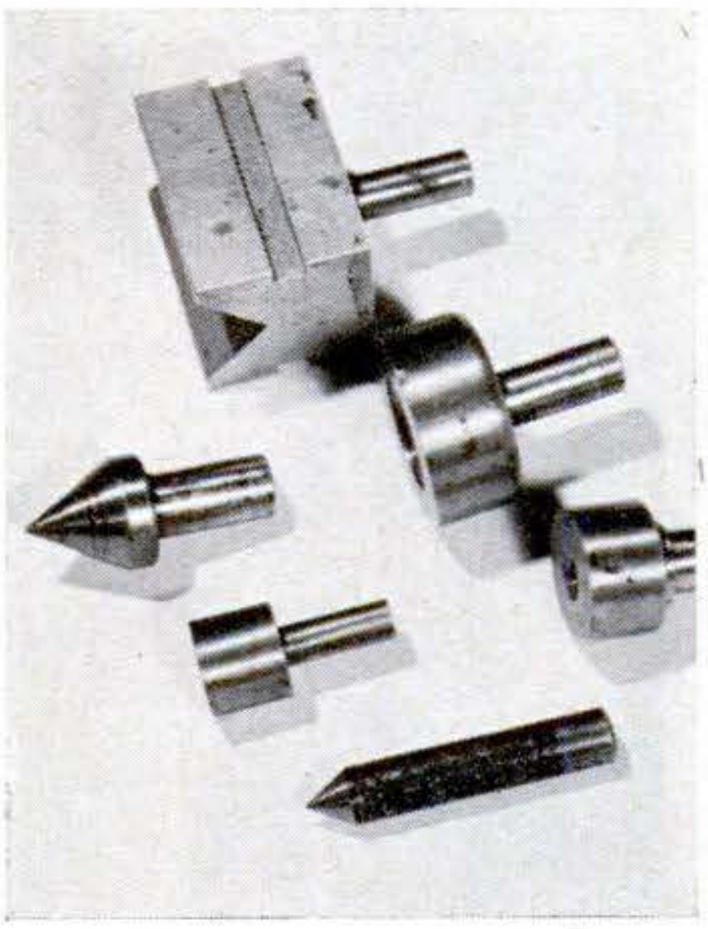
The body, or pivoting tool holder, is turned from ½″ drill rod and bored to fit closely over the ⅜″ drill-rod pivot stud. The stud is shouldered and threaded ¼″-20 to fit in a matching hole drilled in the compound. A slot cut in the top of the stud permits seating it securely.

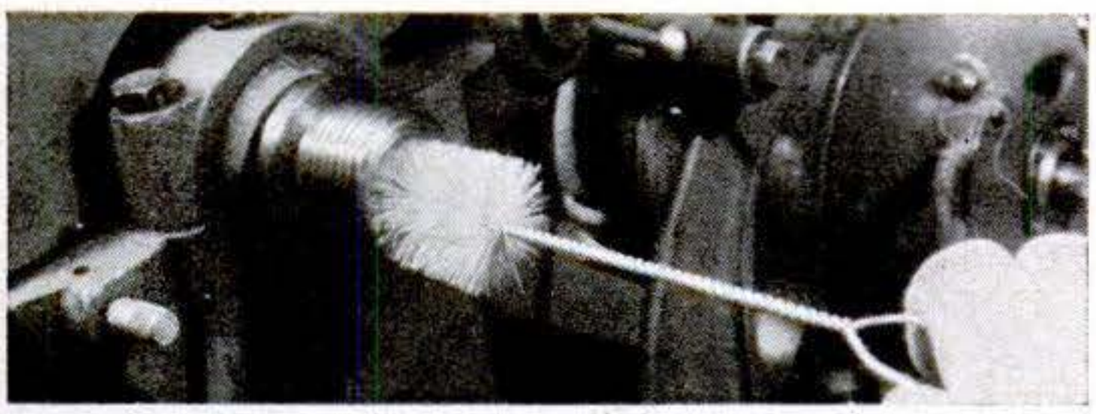
The upper, solid part of the body is drilled for the ¼″ drill-rod cutting tool. Two 6-32 setscrews lock the tool.

In use, the tool is mounted on the compound, set to the desired radius and advanced up to the work. The carriage is then locked and the tool fed into the work by advancing the compound. The tool is pivoted by moving the hardwood handle slowly back and forth. After each pass, the compound is advanced a few thousandths.—*Andrew Pfeiffer, Old Lyme, Conn.*



Tailstock Accessories. These handy lathe accessories are all fitted with ½″ shanks to mount in the tailstock chuck. This eliminates the necessity of removing the chuck to use a taper-shanked drilling pad or center for short jobs. The photo at left shows the V-block attachment in use. At right is an assortment of tailstock-chuck accessories which include V block, drilling pads and centers.





Bottle Brush Cleans Spindles. The stiff bristles of a baby-bottle brush make short work of cleaning chips and dirt out of lathe and milling spindles and tapered tool sleeves. They'll fit everything down to a No. 2 Morse taper and can be bought in any dime store.—*Will Thomas, Buffalo.*

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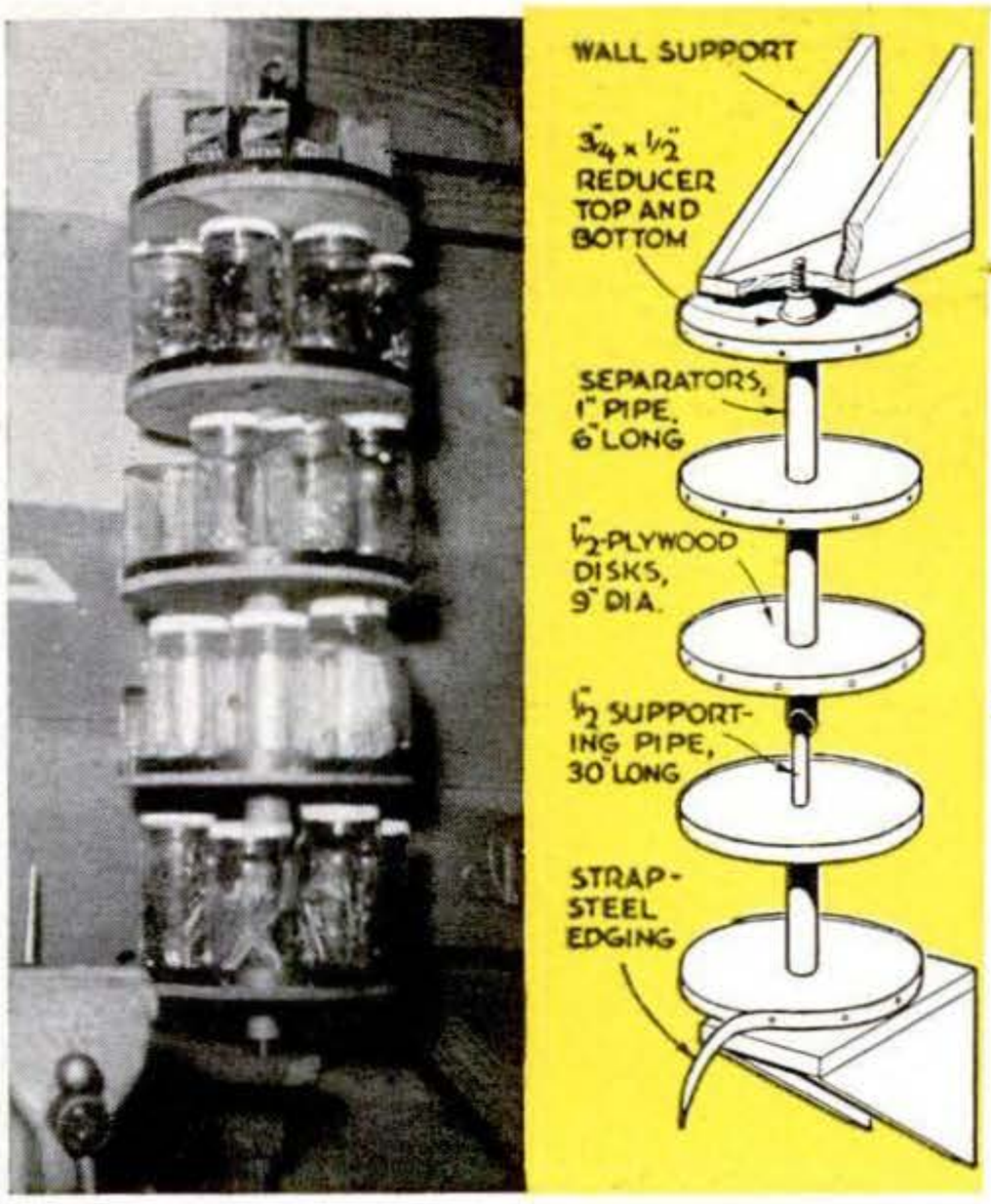
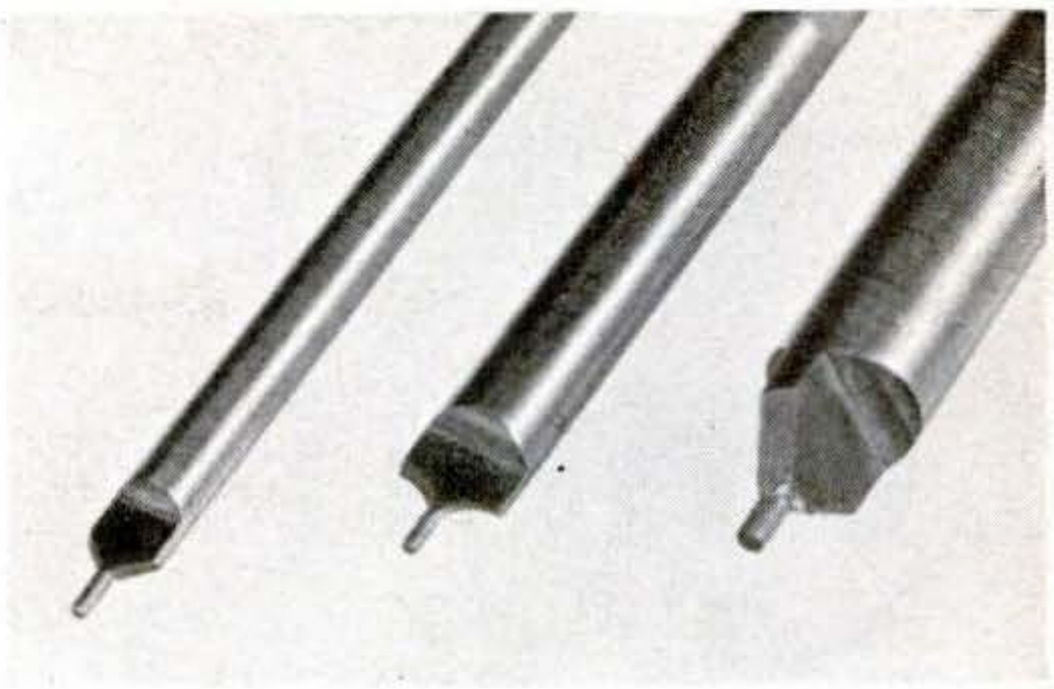


Revolving Shelves Store Parts. A large assortment of screws, nails and small hardware can be conveniently stored in a small space with the help of this five-tier Lazy Susan. Each shelf holds at least a half-dozen jars, and the entire unit revolves, making all jars readily accessible.

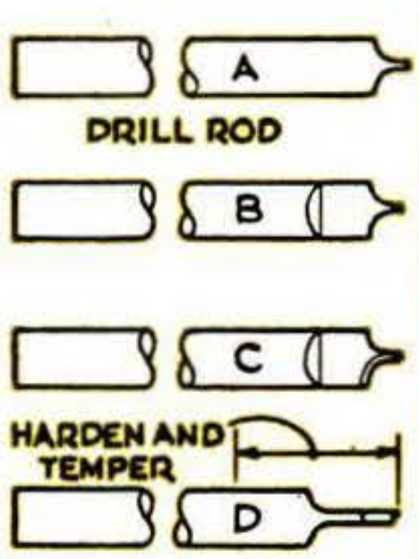
The plywood shelves are separated by four 6" lengths of 1" pipe. The shelves and separators are slipped over a length of ½" pipe and the assembly squeezed together by two reducing nipples. Floor flanges would do as well. The ends of the ½" pipe pivot in holes in the two wall supports. Steel straps, ¾" wide, form a lip around the shelves to keep the jars from slipping off when the unit is rotated.—*R. L. Nelson, Sequoia National Park, Calif.*

Lines Speed Grinding. When joining angle, strap or rod iron, it is often necessary to grind the meeting ends to approximate angles. An emery disk cemented to the disk sander will quickly do the job, and guide lines scribed on the table at 90° and 45° will permit bringing the work up to the disk with fair accuracy without bothering to adjust the miter head.—*Floyd McGuckin, Ridgewood, N. J.*

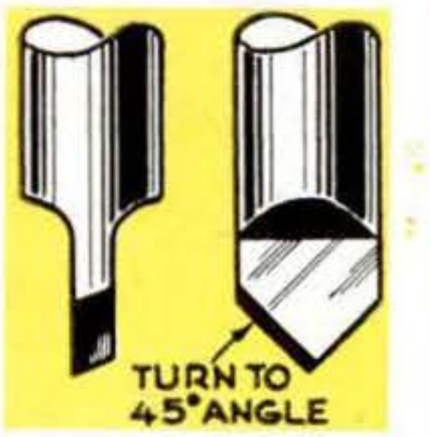


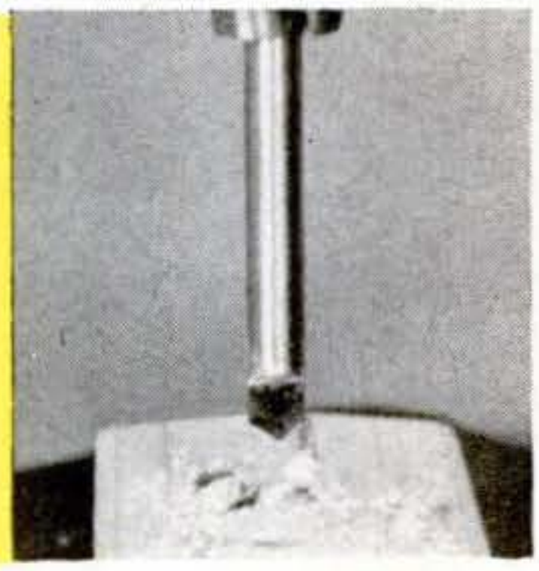
Put Drill-Rod Scraps to Work. Short ends of drill rod are the raw material for a variety of small homemade tools to do special jobs.

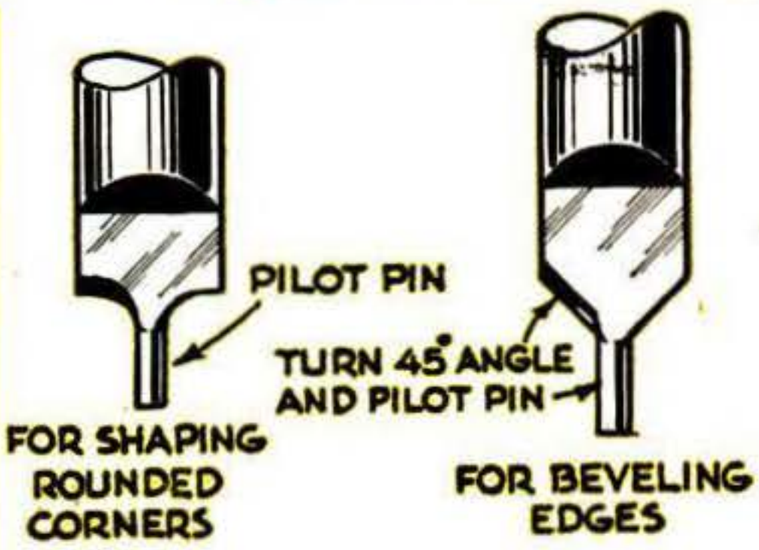
Shown above and below are some typical cutters for use in the drill press. The shapes and purposes vary, but the method of making them is the same as for the fluting router immediately below: Turn the point to the desired shape in the lathe as



shown at A; grind two sides flat and file them smooth (B); file clearance to form the cutting edges (C); harden and temper the cutting edges (D).







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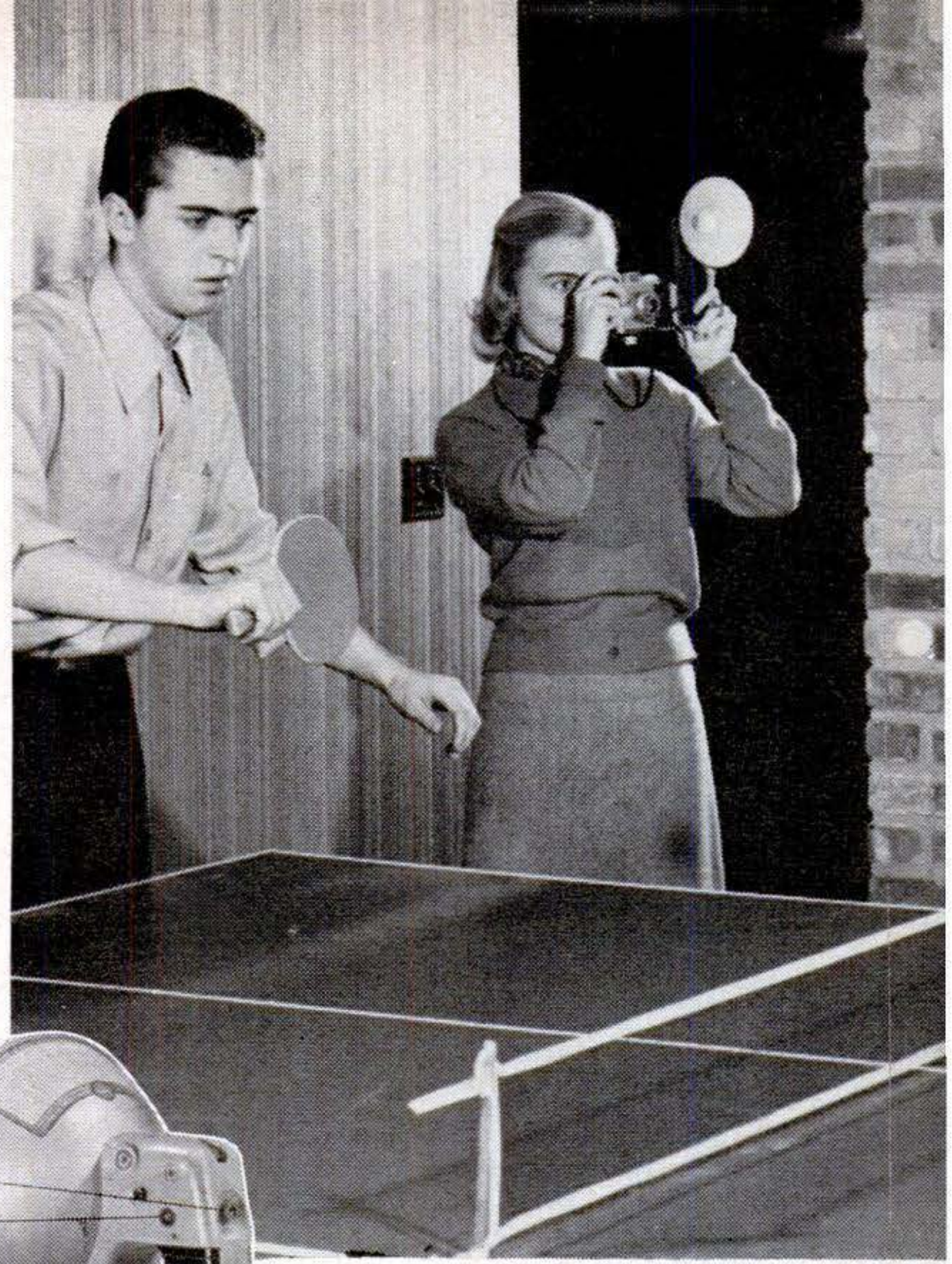
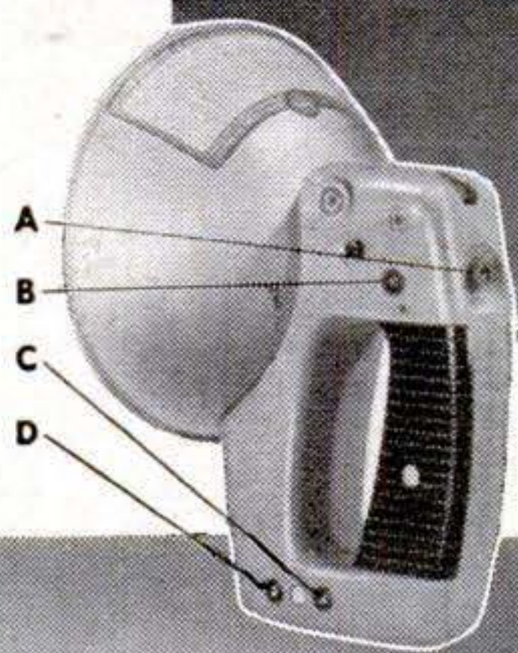
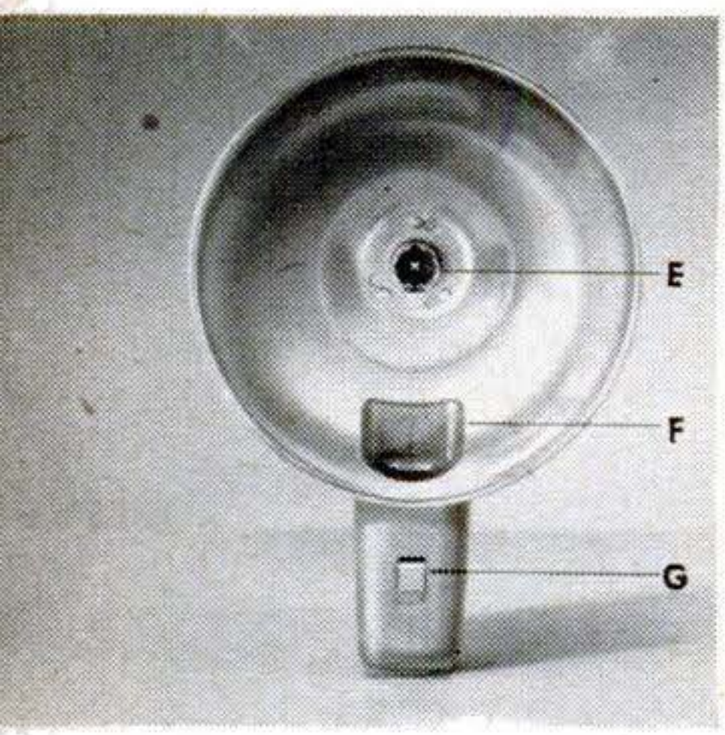
Catch it with "flash"



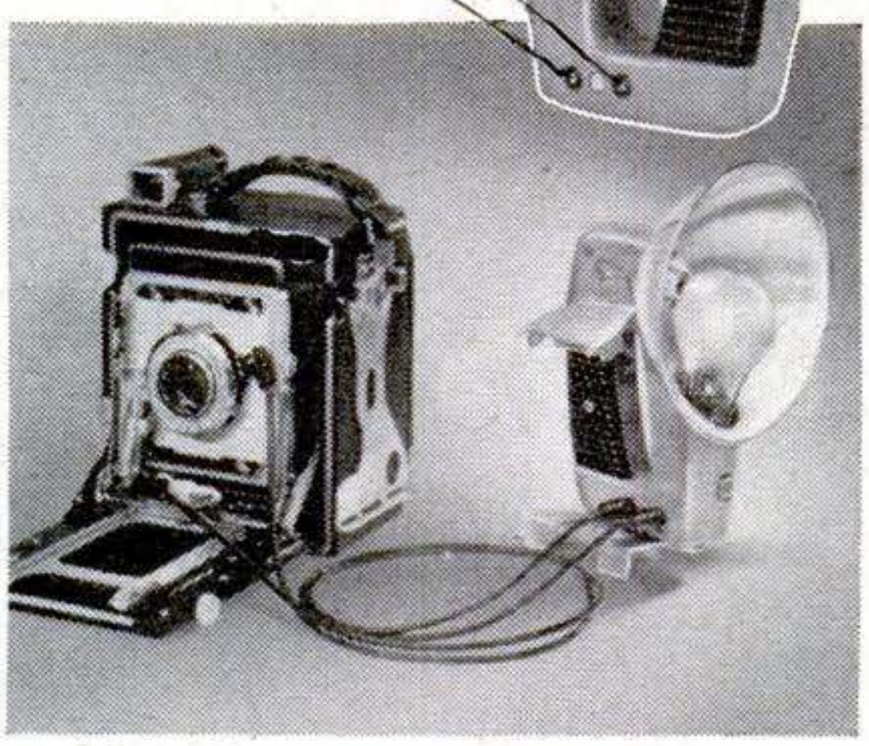
Some of your best snapshot opportunities happen indoors. *The new Kodak Ektalux Flasholder* "catches it" every time. Its 22½-volt battery-condenser power fires lamps dependably and uniformly—peaking time of lamps is more consistent. With Standard Bracket for use with most roll-film cameras, $29.75.

Right:
Accessory outlets on the "Ektalux"—Button **A** for Solenoid ($15.40) permits tripping shutter from Flasholder. Outlet **B** accepts the Remote Release ($4.71). Outlets **C** and **D** take Extension Units ($12.40 each.)

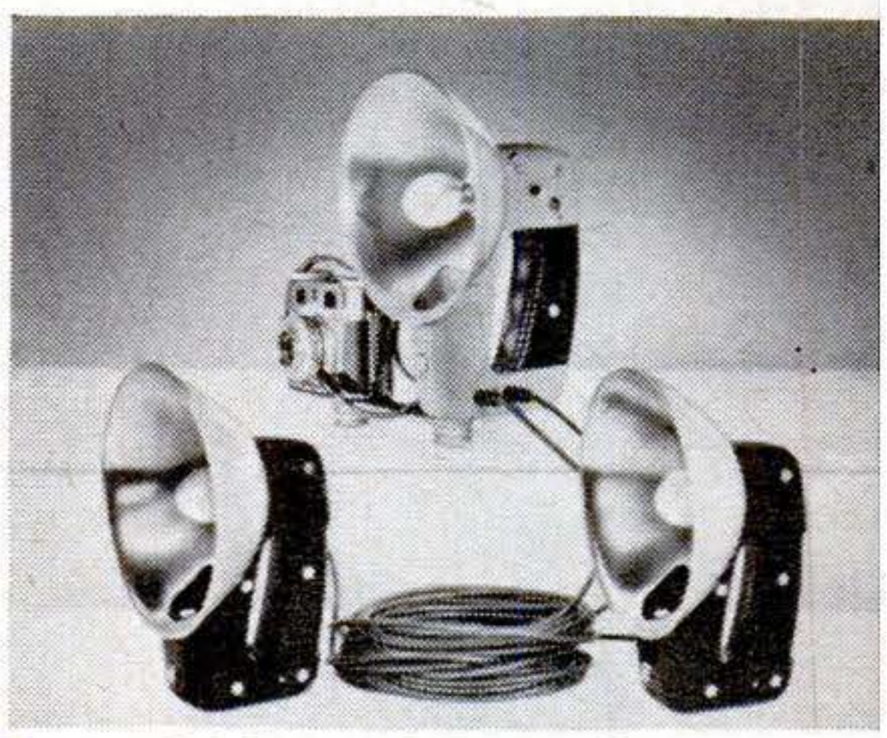




Lamp system is flexible—For midget lamps, note socket **E**; provides for two-way focus. **F** is socket for medium-base lamps, removed by ejector **G**. Exposure table on back of reflector.



Ideal for press cameras, too—The Ektalux Flasholder can be fitted to most press-type cameras. Flasholder and camera lock together firmly and detach quickly. Kodak Ektalux Flasholder with Press Bracket, $33.85.



Dependable multiple flash—Two Extension Units can be plugged into separate outlets on the Flasholder; another Unit can then be hooked to each. Socket in the base fits tripod or Kodak Flexiclamp.

Low price for new Kodak Standard Flasholder—$8.25. Here is dependable flash for most internally synchronized cameras. New rugged hand-grip battery case . . . new rubber cushion riveted to bracket . . . new heavy-duty lamp ejector spring . . . new, handy exposure table on back of reflector.

Convert your old Flasholder to never-fail battery-condenser power—Kodak B-C Flashpack delivers peak energy during battery life. Less battery, $2.95.

Get into your own flash pictures—Attach Kodak Auto-Release to any camera equipped with cable release . . . set it . . . 10 seconds later shutter is tripped automatically. $3.86.

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"Has your tongue been STUNG lately?"

NO TONGUE-STING IN YELLO-BOLE PIPES

Don't smoke a pipe that tortures your tongue! Light up a Yellow-Bole... and *feel* the difference Thanks to that pure honey lining...you can smoke your Yello-Bole to your tongue's content. No "Break-In Blues!" No stung tongue or irritated throat. Switch to a sweet-smoking Yello-Bole...today!

$1.00 to $2.50

YELLO-BOLE PIPES

WIDE VARIETY OF SHAPES...IMPORTED BRIAR

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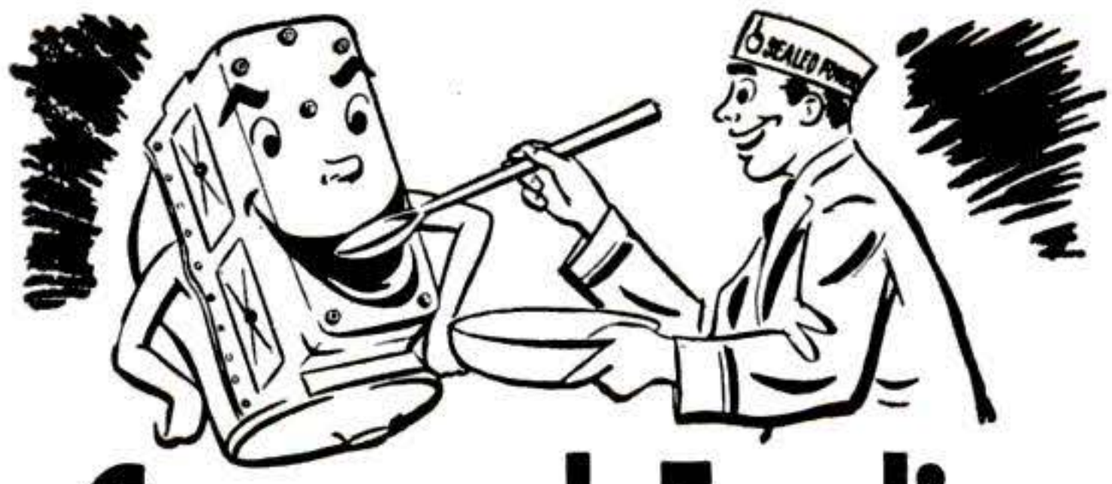
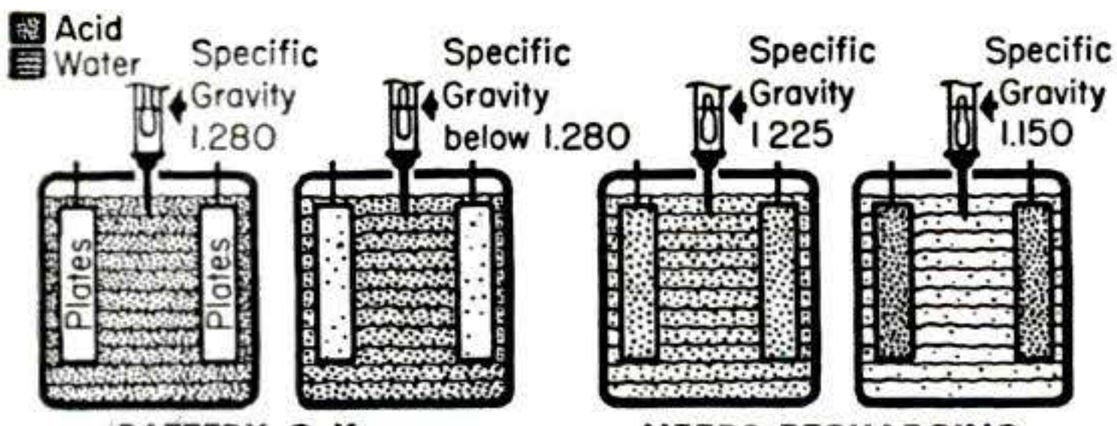


Care and Feeding of Engines BY S. P. CORP

PAMPER YOUR BATTERY

Don't neglect your battery merely because it has power enough to operate your starter. Give it a few minutes' attention at least once a month. Be sure the mounting is tight. Use a mixture of baking soda and pure water to clean off all dirt and corrosion. Have specific gravity checked at any gas station. If it reads below 1.225 in warm weather or below 1.250 in cold weather, have it recharged.



Continued operation below charge permits a hard, crystalline sulphate to develop on plates. This will cause damage if battery is overcharged for a long time on a trip, or when voltage regulator is out of adjustment. Keep the charge consistently between 1.260 and 1.280.

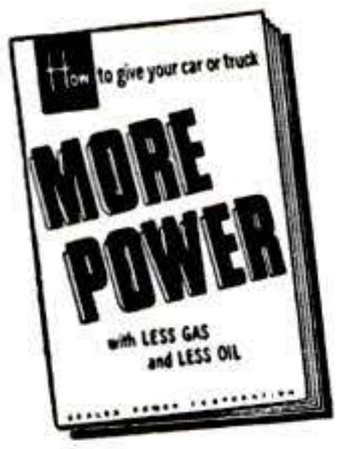
If your battery requires water every week, the charging rate needs adjustment.

WHAT CAUSES HARD STARTING?

Distributor, spark plugs, starter, battery, generator, voltage regulator, or wiring—any of these can contribute to hard starting. Watch all wiring for loose or corroded terminals. Spark plug and coil wires should be replaced if insulation is checked or cracked.

Your car has a one-wire electrical system. Current is returned to battery or generator through a "ground" formed by the metal of the body and engine. To insure a good ground, generator, starter, regulator, distributor, spark plugs and battery must all be securely fastened to clean, tight surfaces. The battery's woven-wire ground strap should have clean, tight connections.

If your starter is dirty, has worn brushes or loose connections, it may rob excessive current from battery or coil, preventing proper firing of spark plugs. A good engine tune-up includes a complete check of the whole electrical system.



WRITE FOR FREE BOOKLET

"More Power, Less Gas, Less Oil" is a free illustrated booklet on car care. Write for it, and learn how Sealed Power KromeX Ring Sets fight heat, friction, abrasion, corrosion—the four deadly enemies of ring life. Sealed Power Corporation, Dept. H-3, Muskegon, Michigan.

The Old Dog Wagon Puts on the Dog

[Continued from page 141]

only about one-fourth down. The O'Mahony company has an interest, therefore, in the owner's success and checks the proposed location before it sells every diner. Traffic past the proposed site is surveyed.

The prospective owner is combed over pretty hard, too. O'Mahony won't sell to an absentee owner because, with an absentee, more food goes out the back door than out the front.

If a location fails to pay off, a 1953 diner can be jacked up, put on wheels and hauled to a more promising spot. But so thorough are these surveys that not one O'Mahony diner has had to be moved in the past 10 years. Instead, bigger diners are continually replacing those whose business has outgrown them.

$1,250 a Week

An owner's possibilities for profit are better than Jerry O'Mahony's were in 1913. Today the net may run to $1,250 a week. "Financial security," says an O'Mahony circular, "is yours for the asking."

Martin Rich, who runs the Old Post Grill diner on U. S. 1, has gone out after that financial security with an O'Mahony diner. His menu is almost as long as the highway. He sells coffee only and also five-course dinners. He specializes in Hungarian goulash and seafoods. He offers your choice of salads, cold cuts, sodas, sundaes and a dozen categories of desserts. You can wash all this down with champagne ($6 a bottle) or with anything else. Here Rich's is different from the typical diner, which does not serve liquor.

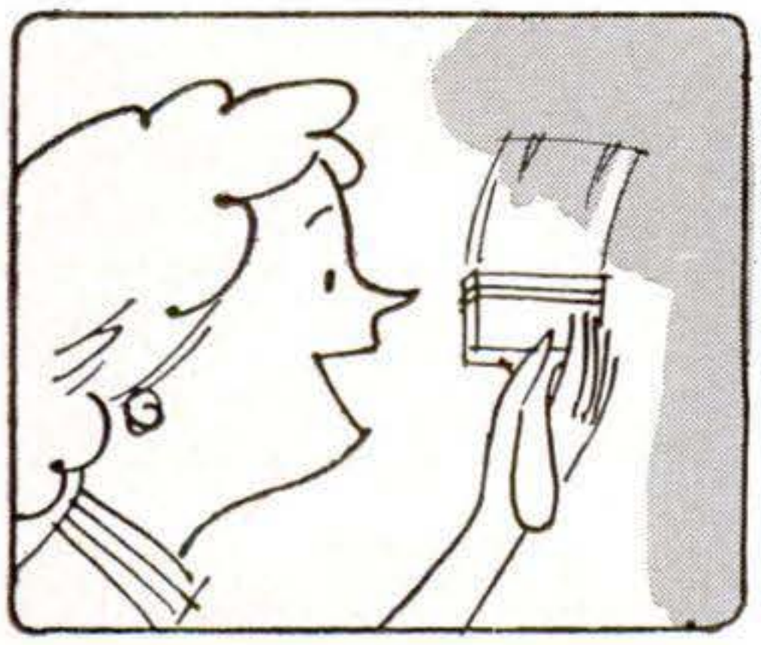
The kitchen at Rich's is a masterpiece of compactness. All cooking apparatus is condensed into a space the size of a truck body—friers, baking ovens, short-order grills, heavy-duty ranges, sinks, storage. The only food prepared in front of the customer is ice-cream dishes.

None of Rich's waitresses has to walk more than 34 feet in any direction to fill

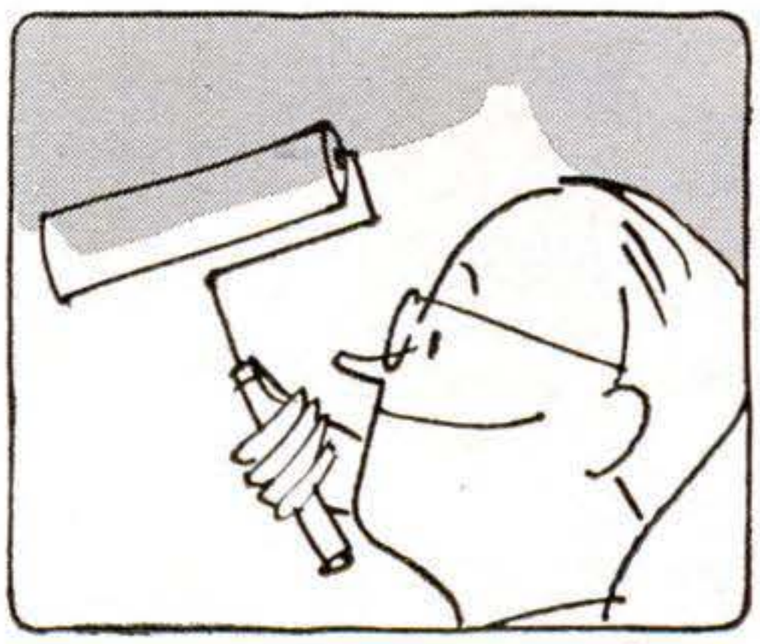
[Continued on page 250]

PAINT YOUR WALLS THE EASY-GOING WAY

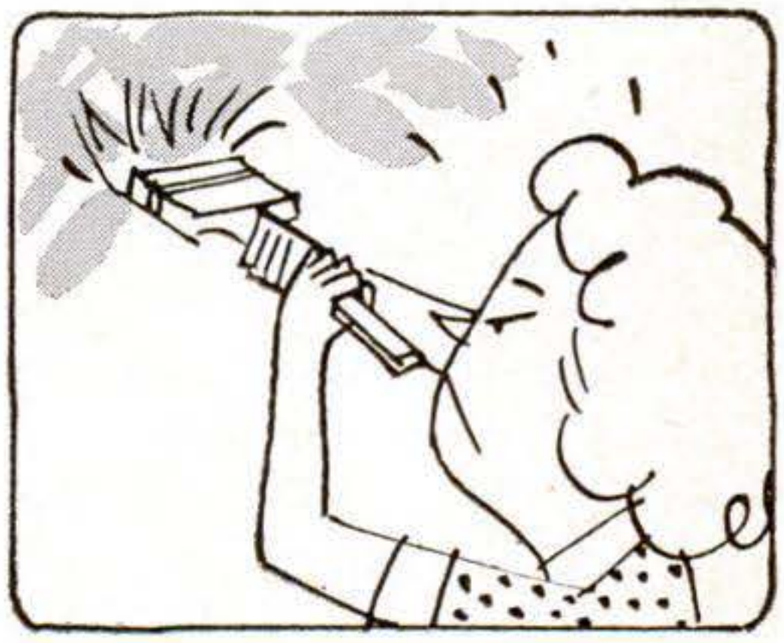
with new Gold Bond Velvet!



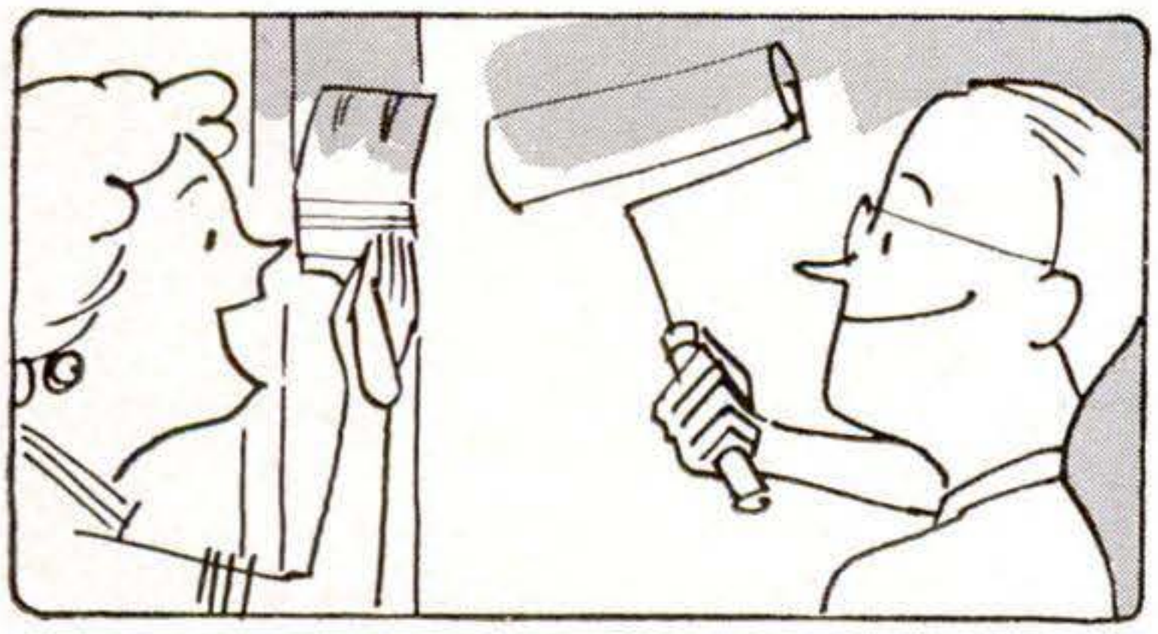
GOLD BOND VELVET is the easiest-going wall paint you ever used! Ready-to-use without the usual mixing or thinning. Dries in minutes to a velvet smooth surface that won't crack, chip or peel.



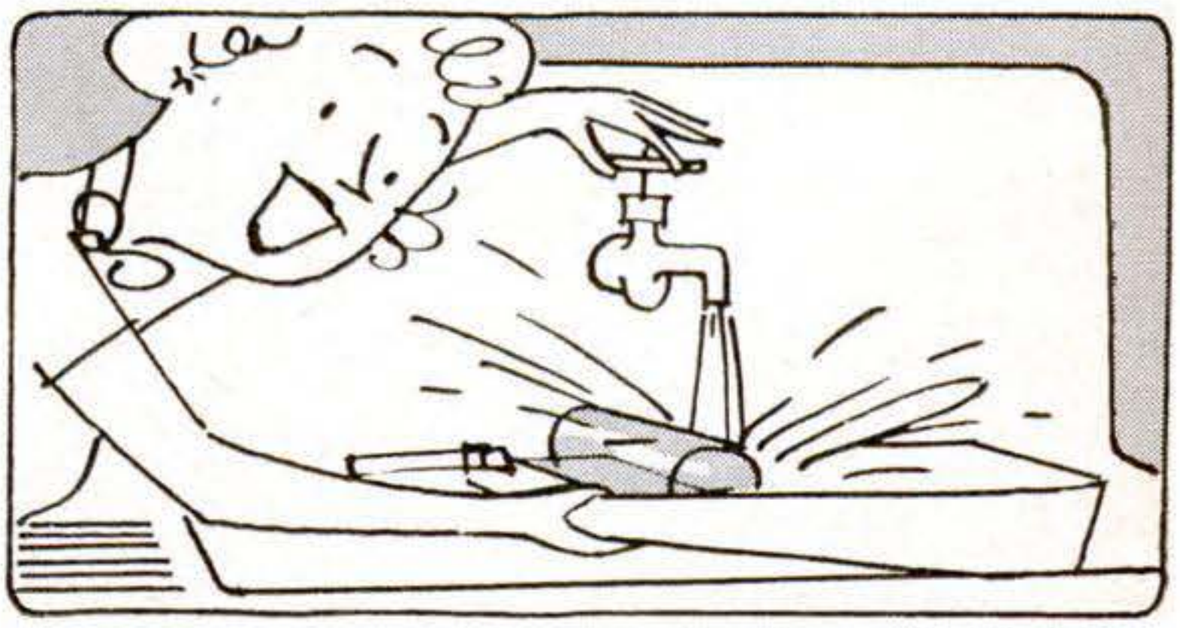
FLOWS ON! Just dip your roller or brush in Gold Bond Velvet and see how it goes on almost by itself! It eliminates what professional painters call "drag." No "painty" odor, either.



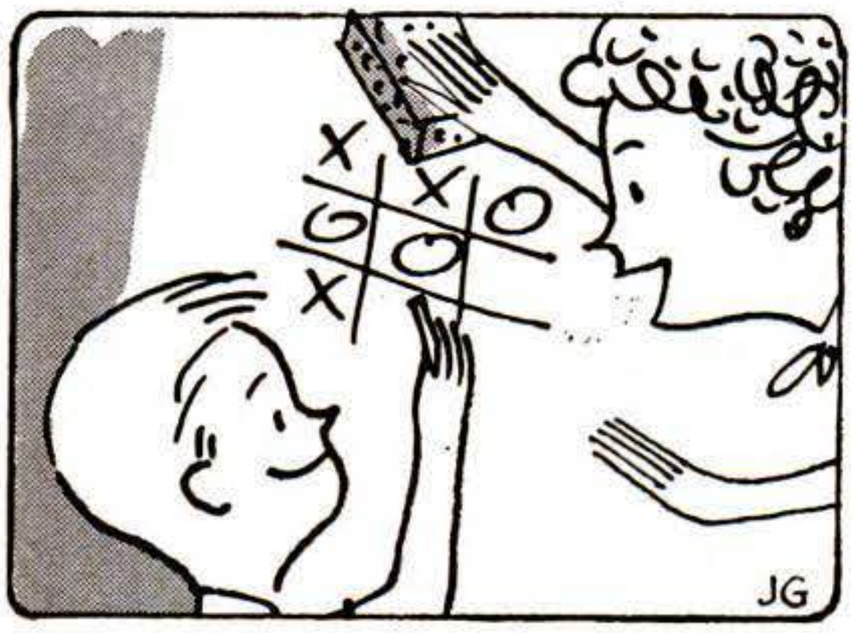
WITH ORDINARY PAINT you have to guard against lap or brush marks, touch-up spots. No worry with Gold Bond Velvet! This latex-base paint blends perfectly and gives a good job every time!



COVERS WALLS AND WOODWORK, TOO! Use Gold Bond Velvet over plaster, wallboards (including "taped" joints), primed wood or metal, concrete and previously painted surfaces.

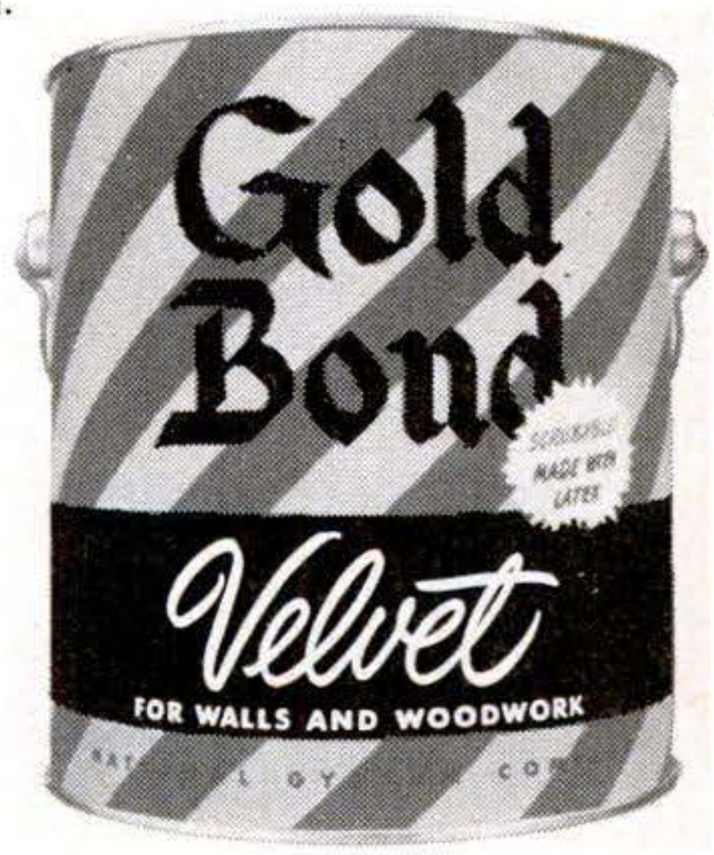


EASY TO CLEAN UP! Brush or roller cleans off with plain water. Spatter or splash marks clean up with a damp cloth. No turpentine needed.



SCRUBABLE! Velvet can be scrubbed repeatedly without harm. Pencil, crayon, finger marks and food smears wash right off!

Ask your paint dealer or lumber and building material dealer to show you the 16 new, intermixable, Velvet colors (plus two whites). The orange and tan Gold Bond label is your assurance of another top quality National Gypsum Company product.



West of the Rockies, ask for Wesco Paints, products of Wesco Waterpaints, Inc., a subsidiary of National Gypsum Company.

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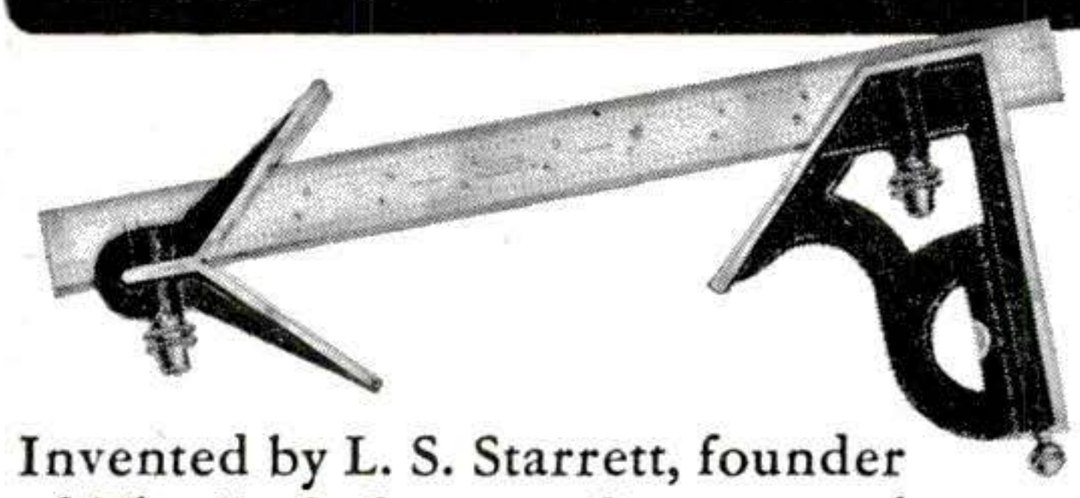
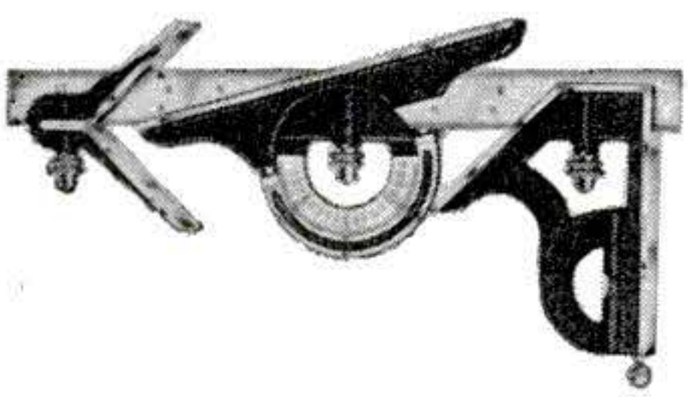
Handiest tool you can own

Starrett

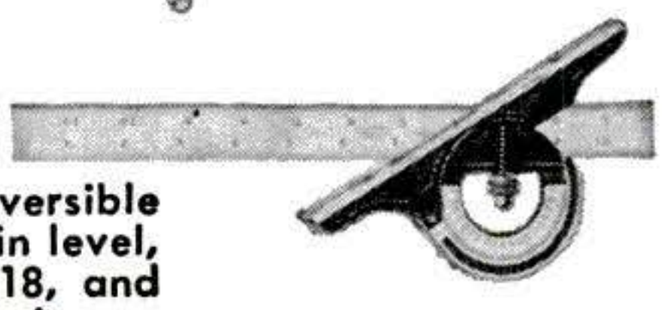
COMBINATION SQUARE



Invented by L. S. Starrett, founder of The L. S. Starrett Company, the combination square combines a rule, square, mitre, height gage, depth gage, level, center gage and scriber — eight handy tools in one! Latest models feature hardened precision ground steel blade with bold figures and sharp, easy-reading graduations; new type quick-reversing lock bolt; easy-to-clean black enamel finish on square and center head; built in level; hardened scriber. Available in 4, 6, 9, 12, 18 or 24 inch sizes, at your Starrett Tool Distributor's.



COMBINATION SETS
With reversible or non-reversible protractor head, square head and center head. 12, 18, and 24 inch sizes.



BEVEL PROTRACTORS
Reversible or non-reversible protractor head, built in level, hardened blade. 12, 18, and 24 inch sizes. Also Metric.

SEND FOR IT — ONLY 10¢
Starrett "Tools and Rules" Book
shows the right tools for any measuring job. 50 pages, 100 pictures, helpful reference tables. Address Dept. PS

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WORLD'S GREATEST TOOLMAKERS
Buy THROUGH YOUR INDUSTRIAL DISTRIBUTOR
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DIAL INDICATORS • STEEL TAPES • PRECISION GROUND FLAT STOCK
HACKSAWS, BAND SAWS and BAND KNIVES

The Old Dog Wagon Puts on the Dog

[Continued from page 248]

an order. This allows Rich to maintain that 20-minute schedule, an important factor with the average check around 60 cents. His 92-seat diner has fed 2,500 persons in one day.

Diners Heading West

Observing the success of Rich and others, the O'Mahony company is expanding. It has just opened a plant in St. Louis, the first one to mass-produce diners west of New Jersey. Transportation costs from the factory to a site are high, and most of the 6,000 U. S. diners are in the East, near the New Jersey factories. But soon, the company hopes, O'Mahony streamlined diners will dot highways everywhere.

In the West, diners will have to compete with de luxe drive-ins, which are rare in the East. No problem, a diner executive said. Drive-ins have limited menus, he insisted, and predicted that diners would beat them.

Customers Come in Limousines

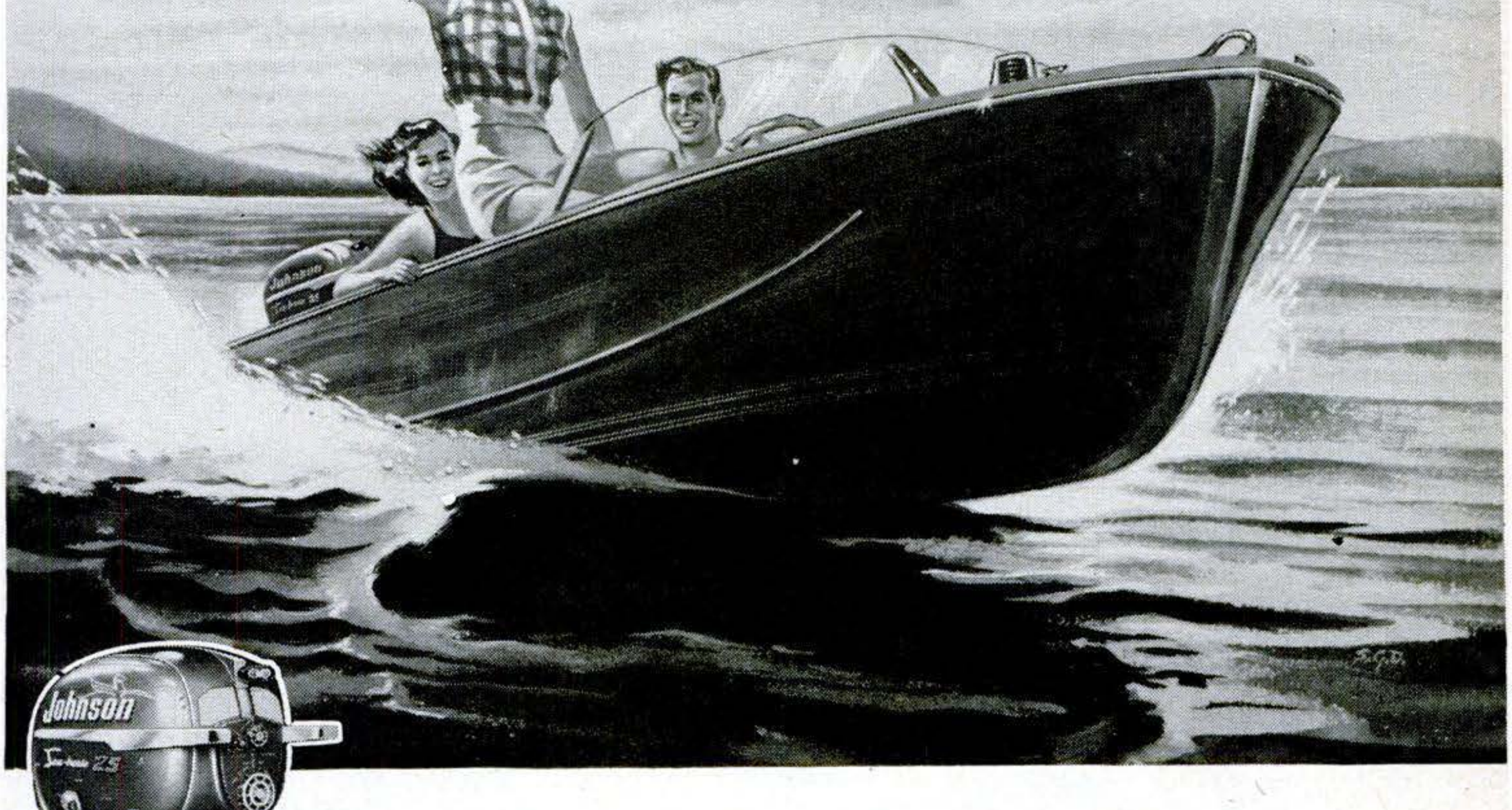
What the company doesn't add, enterprising owners will. One owner in the East put Baked Alaska on his menu and became a success. Dozens of owners have added tablecloths and freshly cut flowers to their tables. This has worked so well at one diner—in Aberdeen, Md. —that three regular customers arrive daily in chauffeur-driven limousines.

But a diner out on New Jersey 29 has added the crowning touch—a headwaiter, complete with tuxedo, who seats the guests. Yet if you approach this headwaiter in shirtsleeves, in overalls or behind a day's growth of beard, he will seat you promptly and won't even raise an aristocratic eyebrow. END

It Always Happens

Science Prof: "What always results when a body is immersed in water?"
Coed: "The telephone rings."—*McCall Spirit.*

Riding High with a "25"



Sea-Horse 25

Once in a lifetime there's a motor like this—an engineering triumph! *Big* power, with *little* weight. Speeds over 30 mph—dazzling acceleration—yet *it trolls!* It's a powerhouse that sends your big boats streaking at express speeds. It gives wings to water skiers, drive to work boat operators, range to "big-water" fishermen—and reality to your dream of low cost DEPENDable outboard cruising! See your Johnson Dealer. Look for his name under "Outboard Motors" in your classified telephone book.

FREE! Write for the new Sea-Horse catalog which describes, in detail, the 4 great Johnsons for 1953. A motor for every outboard need.

JOHNSON MOTORS, 500 Pershing Road, Waukegan, Illinois
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FOR 1953 — FOUR GREAT ALTERNATE FIRING TWINS

SEA-HORSE 3 — 3 hp. 32-lb. twin. Angle-matic Drive. **$145.00***

SEA-HORSE 5 — 5 hp. Neutral Clutch. No shear pin. **$187.50***

SEA-HORSE 10 — 10 hp. Gear Shift. Mile-Master Fuel Tank. Synchro Twist-Grip Speed Control. And *only* **$275.00***

SEA-HORSE 25 — 25 hp. Only 98 lbs! Gear Shift. Mile-Master Fuel Tank. Synchro Twist-Grip Speed Control. **$390.00***

SHIP-MASTER REMOTE CONTROL — Shift-and-throttle. Corrosion-proof. Snap fittings on Sea-Horses 10 and 25. . . . . **$29.50***

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SEA-HORSES
FOR DEPENDABILITY

OBC

**Prices are f.o.b. factory, subject to change.*
OBC certified brake hp at 4000 rpm.
Weights are approximate.

ONE MILLION JOHNSON OUTBOARD MOTORS

SUPERIOR PRODUCTION · SUPERIOR VALUE

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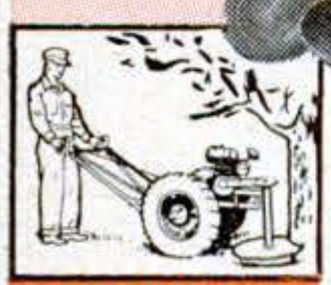
Garden and Small Farm Tractors

STANDARD OF QUALITY FOR MANY YEARS

Rugged 1½ to 5 H.P. Walking Models Do Everything in Gardening Fast and Easy

5 H.P. Walking Model with 10-inch Plow

You can save yourself a lot of work with a Shaw Du-All, the garden tractor that has proved its efficiency and dependability for many years. Handle 6, 7...10-inch plows with these stronger built, superior traction machines. Harrow, disc, plant, cultivate with Shaw quick mount tools. Use power take-off for many other jobs. Choice of 1½, 2½, 3 and 5 H.P machines, with variable speeds, adjustable wheel widths, individual gang tool controls. None better than a Shaw Du-All for rugged work. Power turn models & power take-off attachments available.

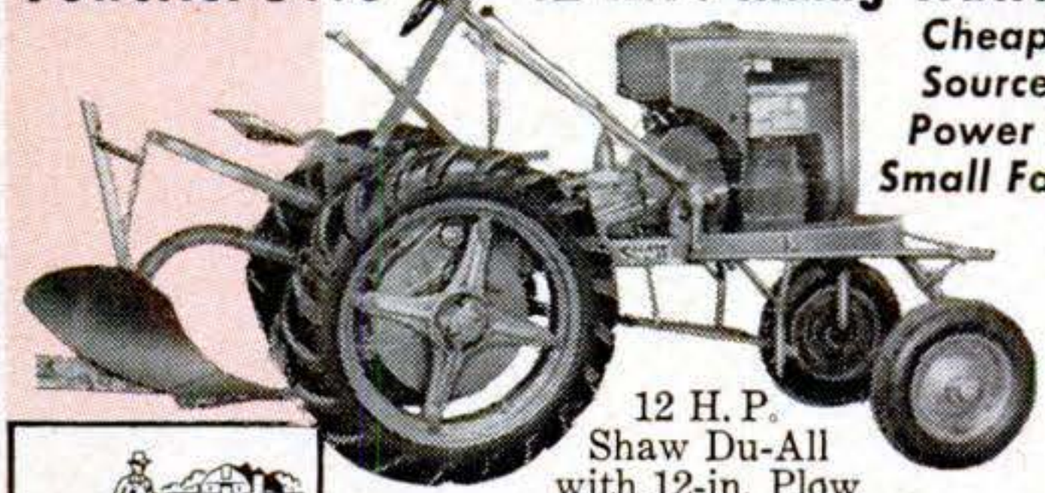


CUT WOOD

MOW

Powerful 5..8 & 12 H.P. Riding Tractors

Cheapest Source of Power for Small Farm



12 H.P. Shaw Du-All with 12-in. Plow

RAKE

BULLDOZE

Plow 4 to 8 acres daily. Cultivate fast and at low cost. Use this larger Shaw Du-All for all small farm ground preparation and cultivation.. for mowing, raking, hauling, sawing, many other purposes. Simplified design and highly durable construction. High quality tools and all wanted power take-off attachments. Pulls 10...12...14-inch plows. Works between or astride 42-inch rows. Ideal machine for small farm or second tractor on larger acreage.

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Please send me Free Catalog and Prices on Shaw Du-All Garden and Small Farm Tractors.

NAME _____

ADDRESS _____

Gus Answers an Ambulance Call

[*Continued from page 198*]

"Gus, we can't wait much longer. I was too optimistic. This man's condition is getting worse."

"One second more, Doc." He leaned under the dash and looked at the switch. Nothing.

His mind flashed rapidly back over the situation. Press the starter button and nothing happened except the clicking of the solenoid. The starter motor itself had seemed all right before. A bad one always sounds or feels different—a looseness, a hesitation, a certain sloppy, grinding edge in the way it turns the engine over. The wiring was in good condition. He had spent possibly five minutes checking it over and there was nothing to be found.

Doc Decides to Go Back

"I'm stumped, Doc. Maybe another car will come along soon."

"Forget about getting to the hospital. We'll have to take him back to the farm. No phone within walking distance, and no time to wait for an ambulance anyway. We've got to get back some way."

"The farm . . . ?"

"I'll have to operate there. There's no other choice."

"Okay. I'll see if I can't push us around and start down the hill. Maybe we can get her going that way."

Gus put a shoulder to the car, turned the wheel and began pushing. It was hard, working against the pull of the hill, but the car began to move slowly, to turn, and then to roll.

Gus hopped in and pointed her down the road. He put the car in gear, heard a loud click and then the beautiful sound of the engine catching hold.

Gus Makes Haste Slowly

"Okay, Doc. I think we're all right now!"

"Thank heaven! Now get us to that farm as quickly as you can. We've got only a few minutes at most."

If Gus had ever experienced a nightmare in broad daylight, this was it. He gripped the wheel hard, trying to make time and yet avoid every bump in the road—and prayed that they would make it.

When they came at last to Williams' place, Gus swung the car gently off the road into the farmyard full of barking hounds. This

[Continued on page 254]

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Fountain of youth for Fords

GENUINE Ford PARTS

WHEREVER YOU SEE THIS SIGN YOU CAN GET THE RIGHT PARTS TO KEEP YOUR OLD FORD RUNNING LIKE NEW

Made right—Because they're designed, "Track Tested" and proved by the men who designed *your* Ford, you can be absolutely sure that Genuine Ford Parts are the right parts for *all* Ford repairs.

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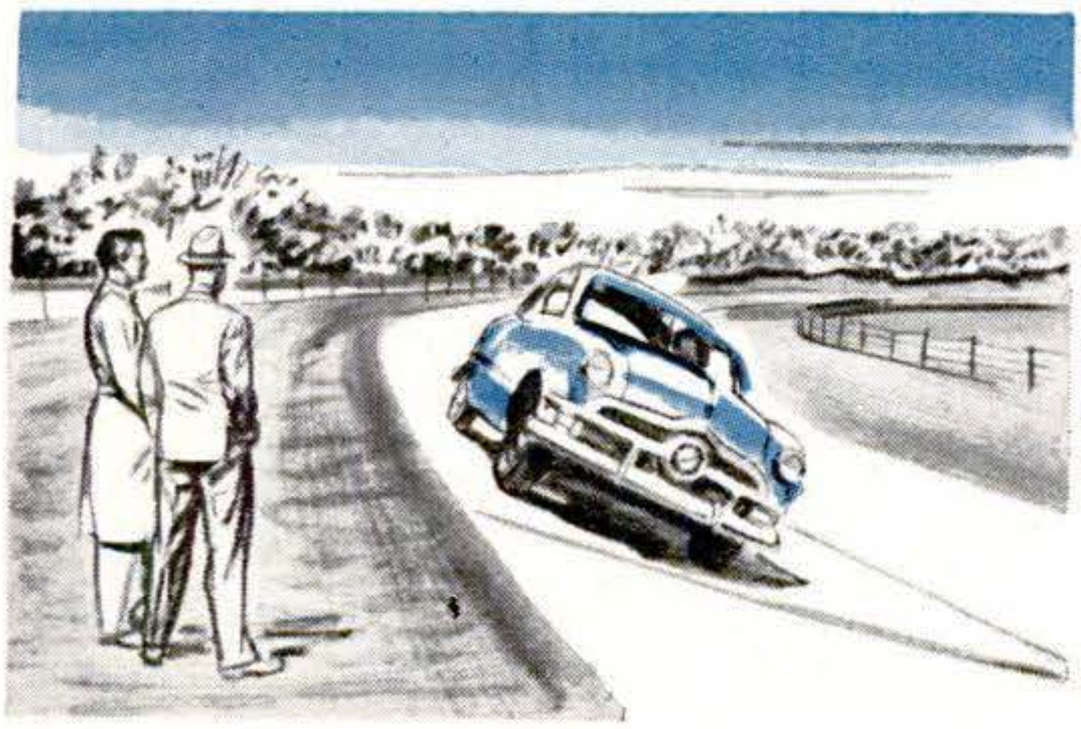

To last longer—Because they're given grueling track tests in Fords by Ford engineers, you can be sure that Genuine Ford Parts are your *best* parts buy. They *keep* your old Ford running like new.

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They keep your Ford all Ford

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You can afford this great finish Sander

Finish Sands 10 Times Faster than by hand

Now, you can get satin-smooth finishes with only one tenth the work of hand sanding. Use the B&D Utility #44 Sander for preparing new surfaces, smoothing seams, refinishing furniture, removing old paint—even a beginner does a professional job with this light-weight (only 5½ lbs.), easy-to-use tool!

TRY IT TODAY at your hardware, appliance or department store. Has such *exclusive* features as: KING-SIZE BOTTOM PLATE extending beyond tool body for close work • MODERN SWITCH HANDLE close to housing for better control, less fatigue • AUXILIARY KNOB HANDLE offering three positions for sanding close to obstructions • UNIQUE PAPER HOLDER stays open while changing paper, frees both hands for job!

Bob Davis says: "This tool gives top performance you expect from the brand the experts choose . . . yet it's priced *below* tools of comparable quality. The name BLACK & DECKER means it's a real tool, not a mere toy, and I recommend it as a fine addition to any shop!"

Black & Decker

ELECTRIC UTILITY TOOLS

PORTABLE ELECTRIC TOOLS

WRITE FOR *FREE* BOOK of helpful, money-saving hints on home jobs to: BOB DAVIS, Home Service Dept. H3S, Towson 4, Md.

Gus Answers an Ambulance Call

[Continued from page 252]

time they carried Bill Williams into the kitchen, to the broad, enameled table.

"Now, put some water on to boil, while I get things ready. Then I'm going to ask you to administer the anesthetic."

"Golly, I don't know, Doc . . ."

"You can do it. Hurry now."

After the water was on, Gus found himself, at Doc's directions, slowly dripping ether into a wad of cotton around Bill's nose. The fumes rose heavily, sickeningly sweet. Gus felt the room begin to spin when he saw the first quick incision, but he closed his eyes and stuck it out.

Gus Nearly Passes Out

"Gus, more ether. You okay?"

"Sure . . . I'll make it." He avoided looking toward Doc. His knees were shaking.

Gus didn't know how long he had been standing there, fighting off the ether, with his eyes closed or turned to the blank wall. Then he heard Doc talking to someone far away, and felt a firm hand under his arm as he was led stumbling to the wonderful fresh air of the front porch.

"Thanks, Doc. Thought I was going to pass out."

"You'll be okay. Tough business for someone who isn't used to it. You should have seen me in medical school when I watched my first major operation. Carried me out like a pile of faded laundry! You did fine, Gus."

"How's Williams?"

"He'll be okay. Up and around in a few days. We made it just in time. I called an ambulance. They'll be here soon to take him to the hospital."

Fresh Air Does the Trick

"Well, I sure had a fright when that car stalled. Maybe I'd better set that carburetor before we try to leave here."

"You up to it?"

"I think so. This air is all I needed."

"Fixing the carburetor won't help with that other business, will it?"

"No. But tell me, how did you get the car started last time the starter wouldn't work?"

"Somebody was kind enough to give me a push. Why?"

"You remember hearing a loud click?"

"Not offhand."

[Continued on page 256]

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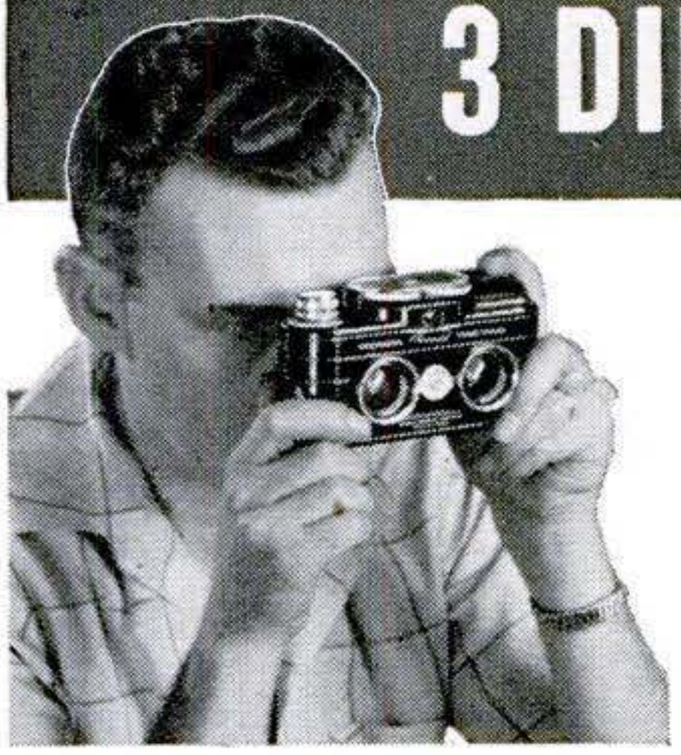
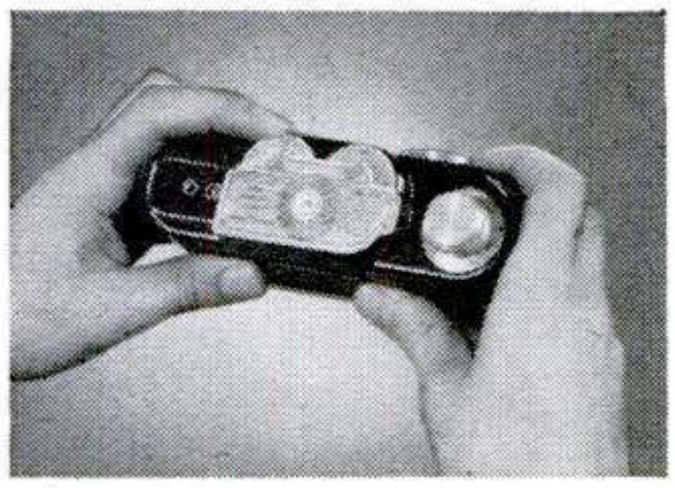
HOW TO MAKE YOUR OWN

3 DIMENSION COLOR PICTURES



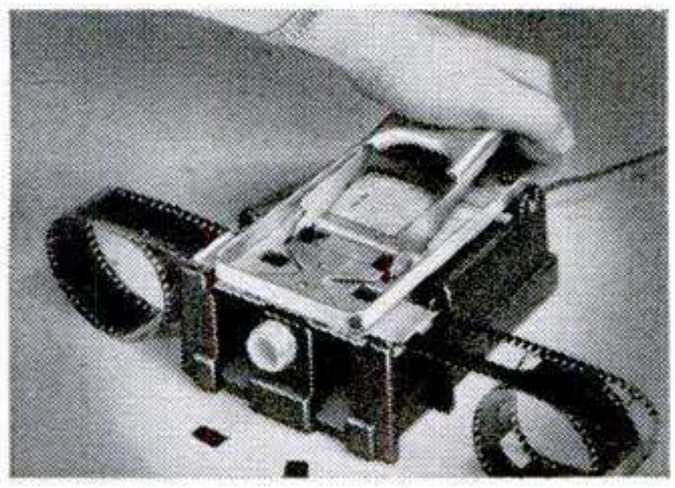
AT LESS THAN SNAPSHOT COST!

Three dimension photography is different because it affords an opportunity for depth planning. Subjects appear to "come to life" in stereo pictures.



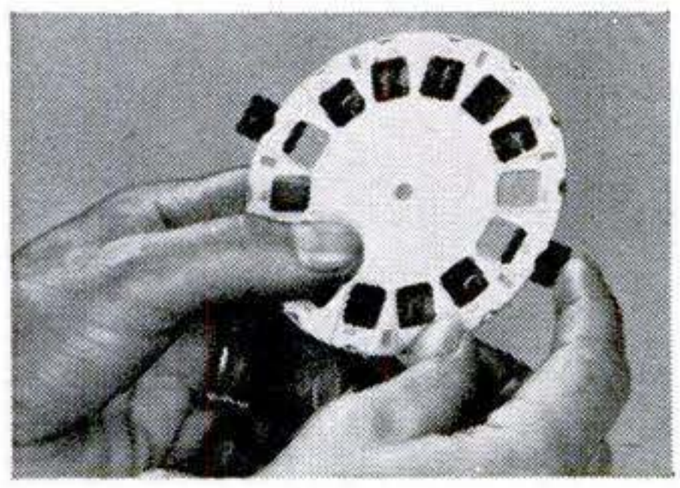
STEP NO. 1

All you need to know is sky condition and subject color. The patented View-Master Expo-Sure guide makes all other adjustments. No focusing necessary. Have film processed in the usual manner.



STEP NO. 2

Semi-automatic View-Master film cutter works quickly and easily. Film is registered perfectly to produce stereo pairs accurately die-cut to 1/1000 of an inch. You get 37 pairs on a 20-exposure film; 69 on a 36-exposure roll.



STEP NO. 3

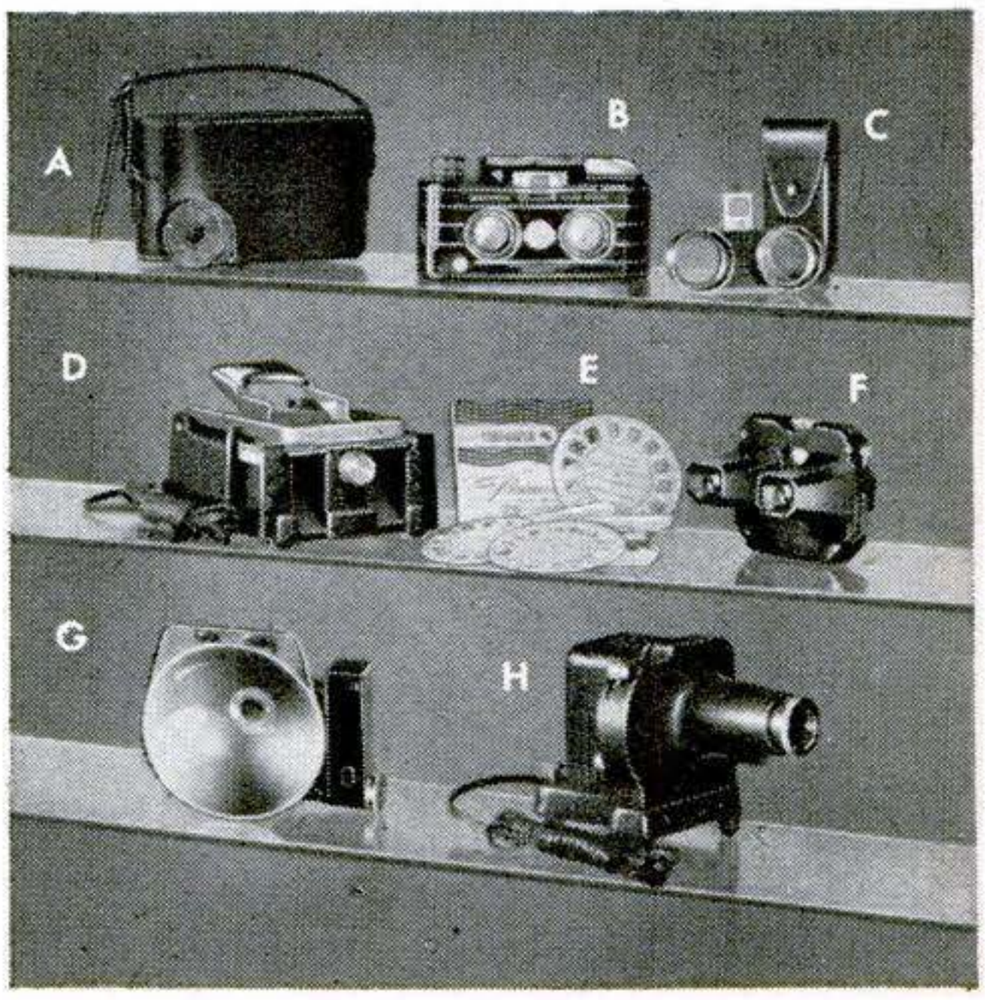
Die-cut film slips into die-formed pockets. Photographically exposed marks on right and left pictures, which correspond with similar marks on film pockets, positively identify pictures and facilitate mounting.

STEP NO. 4

The completed picture is viewed in three dimensions with a View-Master Stereoscope or in two dimensions with a View-Master Projector. An additional advantage is the huge View-Master library of scenic Reels with which to supplement your personal library.

Now, with the new View-Master Personal Stereo Camera, you can take brilliant, full color stereo pictures in thrilling "come to life" realism, for less than the cost of ordinary black and white snapshots. Persons with little or no photographic experience find it easy and fun to make breath-taking three dimension pictures of family scenes, children, friends, vacation travels. The illustrations show the simple steps of View-Master stereo picture-making. Adjust the camera and snap the picture. Have the color film processed. Use the View-Master film cutter to quickly and accurately die-cut stereo pairs. Then insert stereo pairs into blank Personal Reel for exciting viewing.

Integrated Units of the View-Master Stereo System



(A) Carrying Case (B) View-Master Personal Stereo Camera (C) Close-up attachment (D) Film Cutter (E) Personal Reels (F) View-Master Stereoscope (G) Flash attachment (H) View-Master S-1 Projector.

® Sawyer's Inc., Portland 7, Ore.

VIEW-MASTER® STEREOSCOPIC PRODUCTS ARE AVAILABLE AT YOUR PHOTO DEALER

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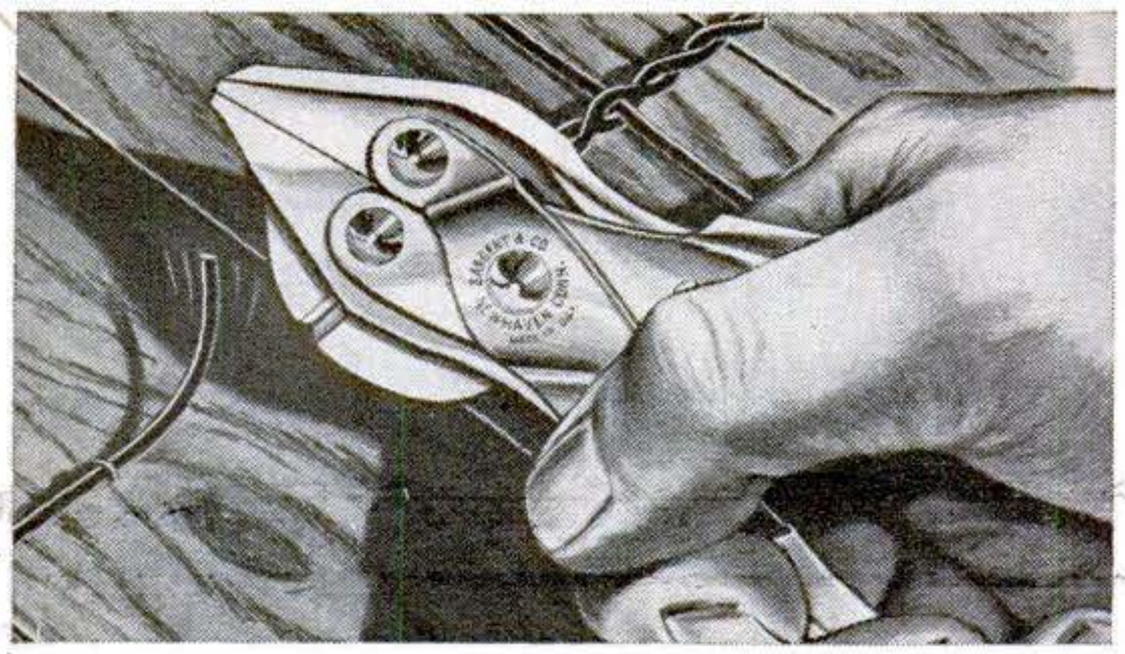

"Buy the tool that does... 5 kinds of jobs well!"

The SARGENT "GRIP-SNIP"*

1. **CUTS WIRE EASILY** . . . outside cutters cut wire even when it tightly hugs a flat surface.

2. **GRIPS LIKE A VISE** . . . a wrench-like grip that doesn't slip. Compound leverage multiplies power along entire length of jaws.

3. **HOLDS NUTS LIKE A WRENCH** . . . powerful parallel jaws and extra leverage prevent rounding corners.

4. **GETS INTO TIGHT SPOTS** . . . small nose of jaws permits working in close quarters.

5. **UNKINKS WIRE** . . . run wire between jaws, from either end, to straighten or pull it.

★ ★ ★

Don't be without your Sargent "Grip-Snip" another day. See 4½, 5½, 6½ and 8-inch lengths at your hardware dealer. Mechanics, sportsmen, farmers and handymen call it their favorite. For further details, write Dept. 26C.

*Trade Mark

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New York
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Chicago

Builders Hardware and Fine Tools since 1864

Gus Answers an Ambulance Call

[Continued from page 254]

"Well, I heard one when we started rolling down that hill. I didn't have much time to think about it until now. Know what it means?"

Doc grinned. "I know nothing about a car's anatomy, Gus."

Russian Roulette with a Flywheel

"It means your car is playing Russian roulette! You need some work done on your flywheel. It has a worn tooth, and if that tooth comes in contact with the starter gear when you turn the motor off, it jams it up. All you get is the solenoid clicking when you push the button. Usually a little push or a bit of jouncing back and forth will free it."

"I'm confused, but I'll take your word for it."

"It might not give you any more trouble for a long time, but there's no point to risking it. I'll pick up a new flywheel for you first thing in the morning."

Gus started the engine, and richened the mixture until it was satisfactory. Then he sat down and stoked up his pipe.

Doc's Offer Is Turned Down Cold

"I'd better go look at my patient. He'll be coming out of dreamland pretty soon. While I do, why don't you think over my offer?"

"What offer, Doc?"

"Joining me in the medical profession. You wield a pretty mean ether bottle!"

Gus winced. "Next time you decide to pay one of your so-called hypochondriacs a visit, you do it by yourself. I've had enough. Give me a garage full of broken-down cars any day, and the good old smell of gasoline!"

Doc was laughing when he went inside, and Gus sat down and tried to remember how quiet the morning had been. END

Next month: Gus finds a golden thread.

Busman's Riddle

LET'S say you are the driver going on a bus from New York to Pittsburgh. Twenty people get on at the New York terminal. In Newark, 14 more people are taken on. At the third stop, six passengers leave. No more passengers get on but several leave. The bus arrives at the Pittsburgh terminal with 19 passengers. Is the bus driver married or single?

ANSWER: You ought to know—you're the driver of the bus.—*The Franklin News*

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Here's a job you can do yourself

Finish your attic with ARMSTRONG'S TEMLOK

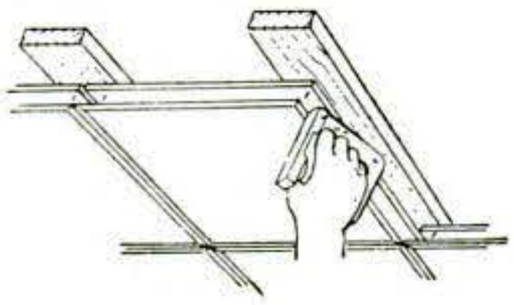
Here's the practical and economical way to expand your home. Build a comfortable extra room in your attic with walls and ceilings of Armstrong's Temlok Plank and Tile. It's an easy job . . . one you'll enjoy doing yourself.

Armstrong's Temlok is a sturdy wood fiber material that builds, decorates, and insulates. Both Temlok Tile and Plank have the exclusive "Lok-Bevel" joint. This tongue-and-groove type joint conceals the nails or staples that hold the material in place and insures a tight, level surface.

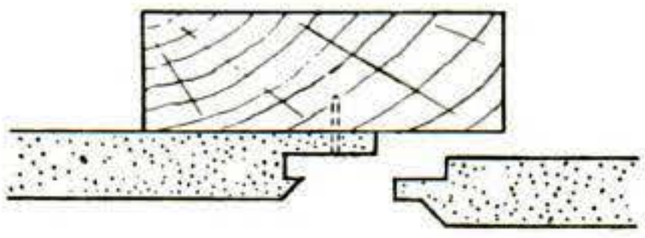
Temlok's smooth factory finish is ironed on. Temlok Plank comes in a soft random coloring called "Suntan Blend." Temlok Tile is finished in both Snow White and Light Ivory.

Ask your lumber dealer about Armstrong's Temlok. He'll show you samples and help you plan your job. For the free booklet, "New Ways to Remodel an Old Home," write Armstrong Cork Company, 9203 Ross St., Lancaster, Pa.

Nail 1" x 3" wood furring strips on 12" centers over the framing members. For extra insulation, staple Armstrong's Insulating Wool between knee wall studs and rafters.



Staple Temlok Tile or Plank to the furring strips. Shim if necessary for level surface. Stapling usually permits more rapid application, although nailing is equally effective.



The Lok-Bevel joint conceals the staples and makes installation easy. It also allows for seasonal expansion and contraction, preventing unsightly open gaps at the joint lines.

ARMSTRONG'S BUILDING MATERIALS

Temlok® • M-67 Monowall® • Cushiontone® • Insulating Wool • Hardboards

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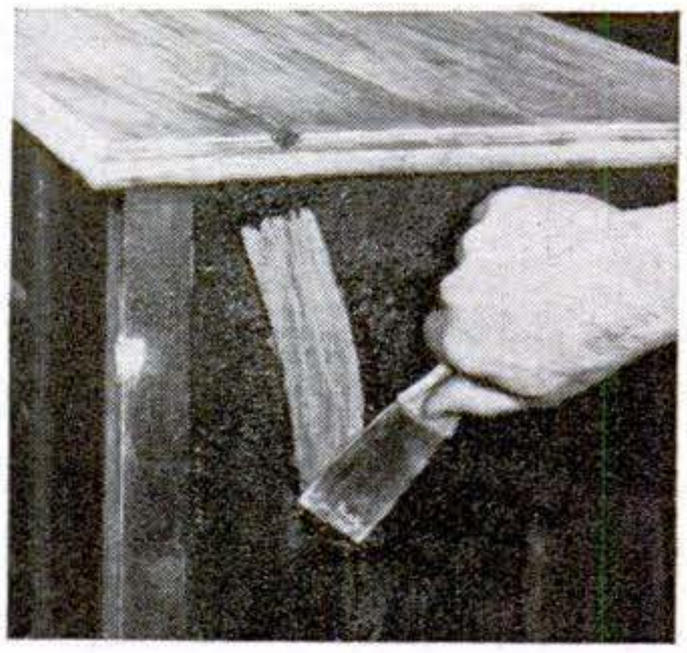
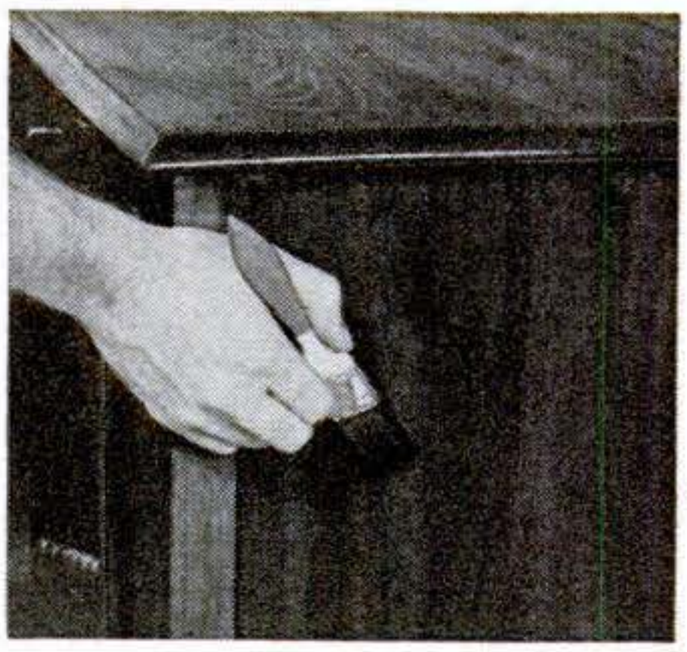
Hints on How to Refinish Furniture



Step 1. *Remove old finish*—quickly, easily, with fast-acting Strypeeze. Brush on, let it set . . . off comes the old finish. (hint: sprinkle sawdust over Strypeeze. "Roll off" sawdust, Strypeeze and old finish.)

Step 2. *Fill all holes, nicks* — permanently and simply with Savogran Wood Putty. Tools easily, won't shrink. Now, sand entire surface with 6/0 sandpaper. (For cracks in plaster, use Savogran Crack Filler. It's the original patented quick-hardening water putty.)



Step 3. *Refinish*—before you start, be sure brush is clean. Savogran Kwikeeze really cleans varnish brushes. Leaves no specks of old varnish, dirt in brush to mar finish. Apply stain, thinned shellac seal, then spar varnish or dull "rubbed effect" varnish in finishing.

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PRODUCTS . . . at better paint & hardware stores
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SAVOGRAN CO., Dept. 28, 25 Huntington Ave., Boston 16, Mass.

"Soup" Fights Airplane Fires

[*Continued from page 148*]

eter protective cone of foam. When the jeep has exhausted its own supply of foam-making ingredients, it can hook up to a carrier's main foam supply.

The present jeep, which, like the Big Squirt, is experimental, cannot move while it is pumping foam. A later version probably will inch in on the fire.

Big Squirt Wallops Harder

The Big Squirt fights crash fires in the same way but packs a bigger wallop. Its 175-horsepower truck engine is for locomotion only. Each of two twin pumps is driven by a separate 140-horsepower engine. Two spray turrets are raised, lowered and swiveled by separate sets of three battery-operated electric motors. In about two minutes they can cover the biggest bomber, as much as 150 feet away, with a 15,000-gallon blizzard of snowlike foam. Ground-sweep nozzles lay down a safety carpet of foam as the truck drives closer to the fire.

The Big Squirt is commanded by a crew chief who stands behind safety glass at a remote-control panel on a "bridge" on top of the truck. He directs operations over loudspeakers. The firemen ride on each side of the truck to handle hose lines.

In the Squirts, the Navy feels that it has developed the best military crash-fire-fighting vehicles in the world. With more than 50 percent of civilian aircraft accidents taking place at or near airports, on take-offs or landings, the need for similar fast, light equipment to kill fire before fire kills people is obvious. END

Right Arm Is Wrong

THE doctor, after vaccinating young Tommy, moved to bandage the scratch.

"Wait a sec, doc," said Tommy. "Put that bandage on my other arm."

"But, Tommy," the doctor protested, "the bandage is to protect your sore arm—so the boys at school won't be hitting it."

"You don't know the kids in our gang, doc. If you want to protect my vaccination from them, put the bandage on my good arm."—*L & N Magazine.*

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I WASTED MONEY BECAUSE A GAUGE WAS MISSING

by JOSEPH CATANZANO

That's a fact . . . I'd been tossing dollar bills out of the window of my car because a gauge was missing from my dashboard. I didn't realize *how much* I'd been wasting until I installed the Mile-O-Meter my wife gave me for my last birthday. That's the day I began to save . . . I've got four new tires now to prove it.

MOUNTED MILE-O-METER ON MY DASH

The instructions that came with the Mile-O-Meter seemed complete enough, but I didn't realize *how* complete until I lifted the hood of the car and began to follow directions. I actually finished the entire installation without doing anything really complicated! I mounted the Mile-O-Meter itself at the corner of the dashboard on the driver's side, using one of the screws on the windshield flange to hold the bracket. I didn't have to drill a single hole.

GAS SAVINGS ARE MOUNTING

I got my first shock when I took the car out for a trial spin that day. The Mile-O-Meter indicator practically shouted at me that I was pouring gas out of the tail pipe! I tried it again, this time keeping a light foot on the accelerator. The difference in gas consumption, shown clearly on the relative miles-per-gallon scale, almost floored me . . . I was traveling practically as fast, with just about as much power, yet I was using far less gasoline than before! Now all I have to do is drive so the Mile-O-Meter indicator points as far to the right as possible. When I do that, I know I'm getting my best mileage . . . and the gas savings are really mounting up to prove it.

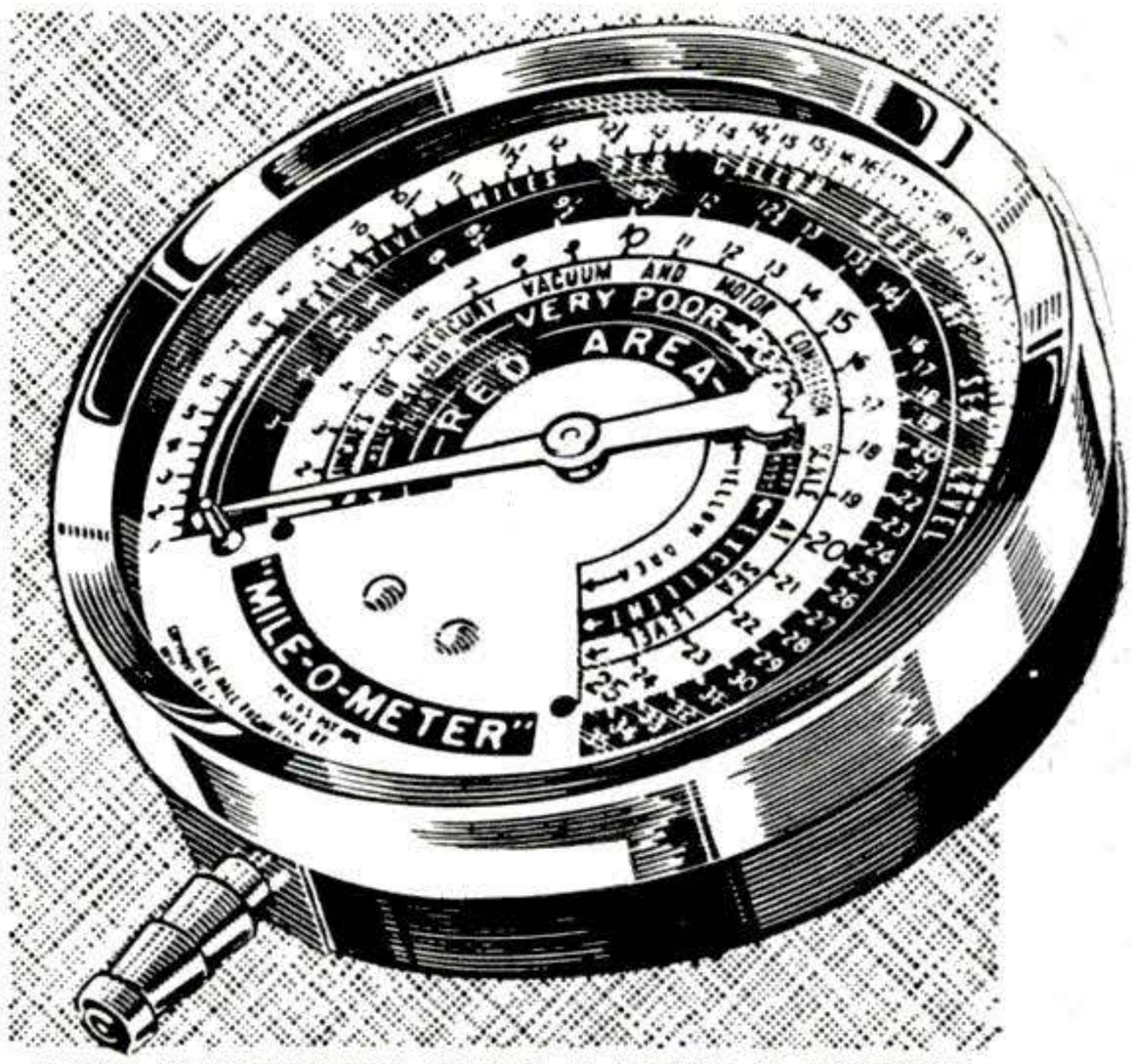
AVOIDED COSTLY REPAIRS, TOO

About three months ago, I noticed that the indicator on the gauge flickered downward every second or two. I didn't *hear* anything wrong with the engine, but according to the tune-up chart supplied with the Mile-O-Meter, I had a spark plug that wasn't firing properly. By following directions, I found which plug was fouled, replaced it . . . and saved myself expensive trouble later on. Another time. the Mile-O-Meter indicated that my carburetor needed adjustment — and, with the tune-up chart, enabled me to adjust it myself! The way the Mile-O-Meter works sounds a bit complicated, but as I understand it, the gauge is kind of like a doctor with his finger on your pulse all the time . . . it gives a continuous report on the general "health" of your engine. It does this by measuring the vacuum in the intake manifold, just as a mechanic does when he's tuning up your car. As a result, I know when adjustments are needed to avoid those wallet-busting repairs.

(Joseph Catanzano, 75 Mary St., Arlington, Mass., is typical of thousands of enthusiastic Mile-O-Meter owners. We thought his experiences with the instrument would interest you.)

I'M REALLY SAVING MONEY!

It's the truth . . . I'm really saving money. I'm getting three or four more miles to every gallon. I *see* (instead of *hear!*) when my engine needs attention. And, I've been able to make many of the minor repairs and tune-ups myself, because the Mile-O-Meter and its chart showed me how.



YOU OUGHT TO OWN A MILE-O-METER

I admit it . . . I'm sold completely on the Mile-O-Meter. If you don't have one on your dashboard, the chances are you're still wasting just as much money as I did. You've got everything to gain by installing a Mile-O-Meter . . . and nothing to lose, because they're always sold on a "money back if not completely satisfied" basis. You ought to send your order in right away.

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Deluxe Illuminated.
- 3⅝" diameter.
- Chrome trim.

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Orders are shipped within 24 hours anywhere in the U. S. A. We pay postage when payment accompanies order. Add 35c for special delivery, if desired. Each Mile-O-Meter is gift-packaged, with all accessories and instructions included.

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"Seals Cylinder Head Gaskets... *so it will seal about everything*"

A foreman of a big engine rebuilding shop says, *"We coat both sides of all cylinder head gaskets with Form-A-Gasket and brush it into the stud and cap screw threads. It is a positive seal without cementing."*

Keep Form-A-Gasket handy in your workshop as an all-purpose gasket and pipe fitting compound.

3 TYPES for your convenience

No. 1 sets quickly, dries hard. No. 2 sets slowly, is non-hardening. Aviation No. 3 is a brushable liquid that sets to a paste. All three make leakproof, pressure-tight seals in threaded, hose and flange connections.

Send for free illustrated catalog

PERMATEX COMPANY, INC.
Brooklyn 35, New York

Central Cooling Next?

[*Continued from page 155*]

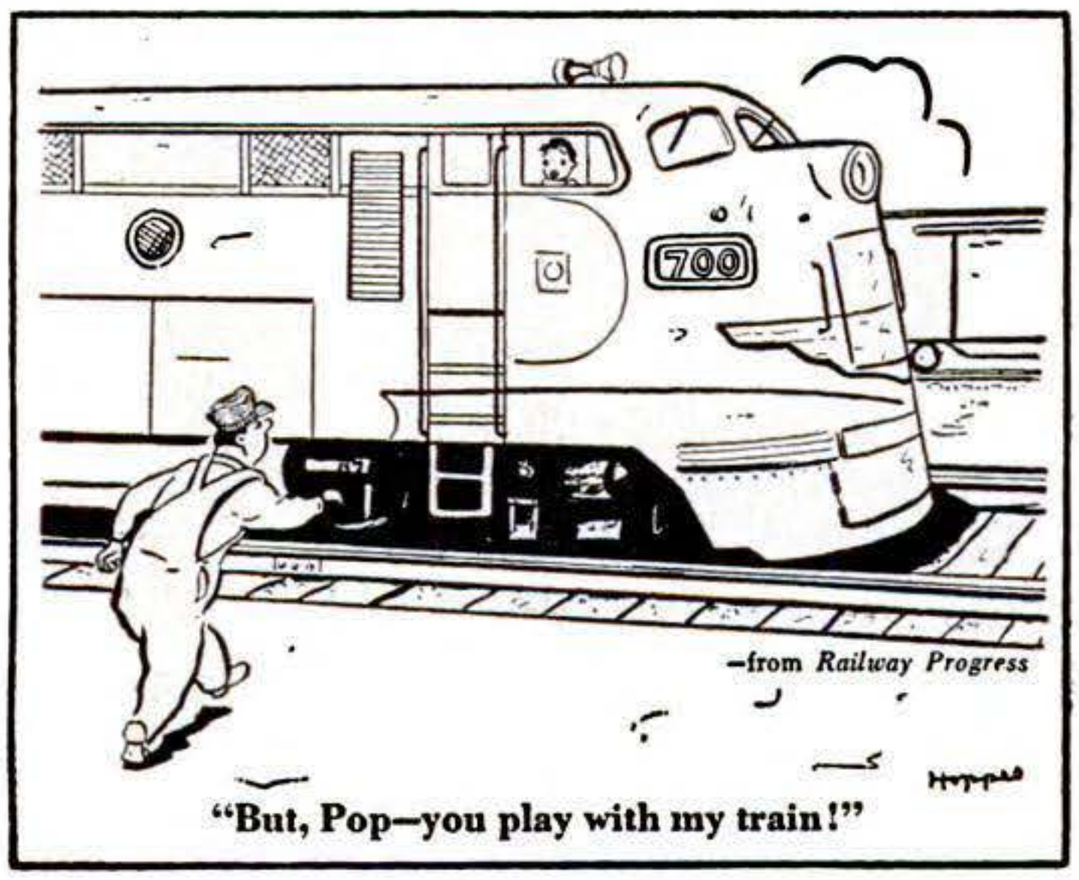
An air-conditioning unit can be used in a basementless house as well as any conventional heater. In the London Homes project at New Orleans, it was installed in a five- by six-foot utility room off the central hall. The unit can be carried into the house in two sections, each of which will go through a 30-inch door.

Manufacturers hope, of course, that home air conditioners will be sold for old as well as new houses. If you are thinking of replacing your furnace with one, the first thing to do is to have an expert check the adequacy of the duct system. Cooled air warms up faster than warm air cools off. Therefore it must be circulated faster than warm air, and the duct system must have about 25 percent more capacity. A room that can be heated with one or two outlets needs three for efficient cooling.

Cleaning Chores Lightened? Well, Maybe

You might think that cool comfort is all the excuse needed for an air conditioner. But the advertising writers claim all sorts of incidental benefits. They work themselves into a lyrical frenzy describing the high-toned living possible in an air-conditioned house.

Some of this may be true, but if you hear a horselaugh when the salesman says that an air conditioner banishes the dust mop and the vacuum cleaner, that will probably be the little woman, who believes that wherever there are people, there is cleaning to do. END



"But, Pop—you play with my train!"

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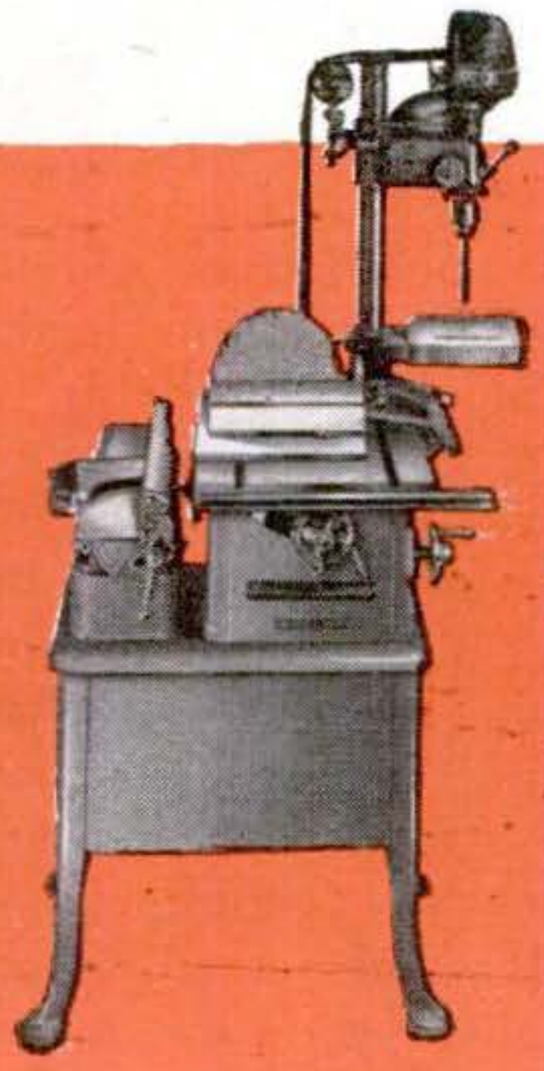
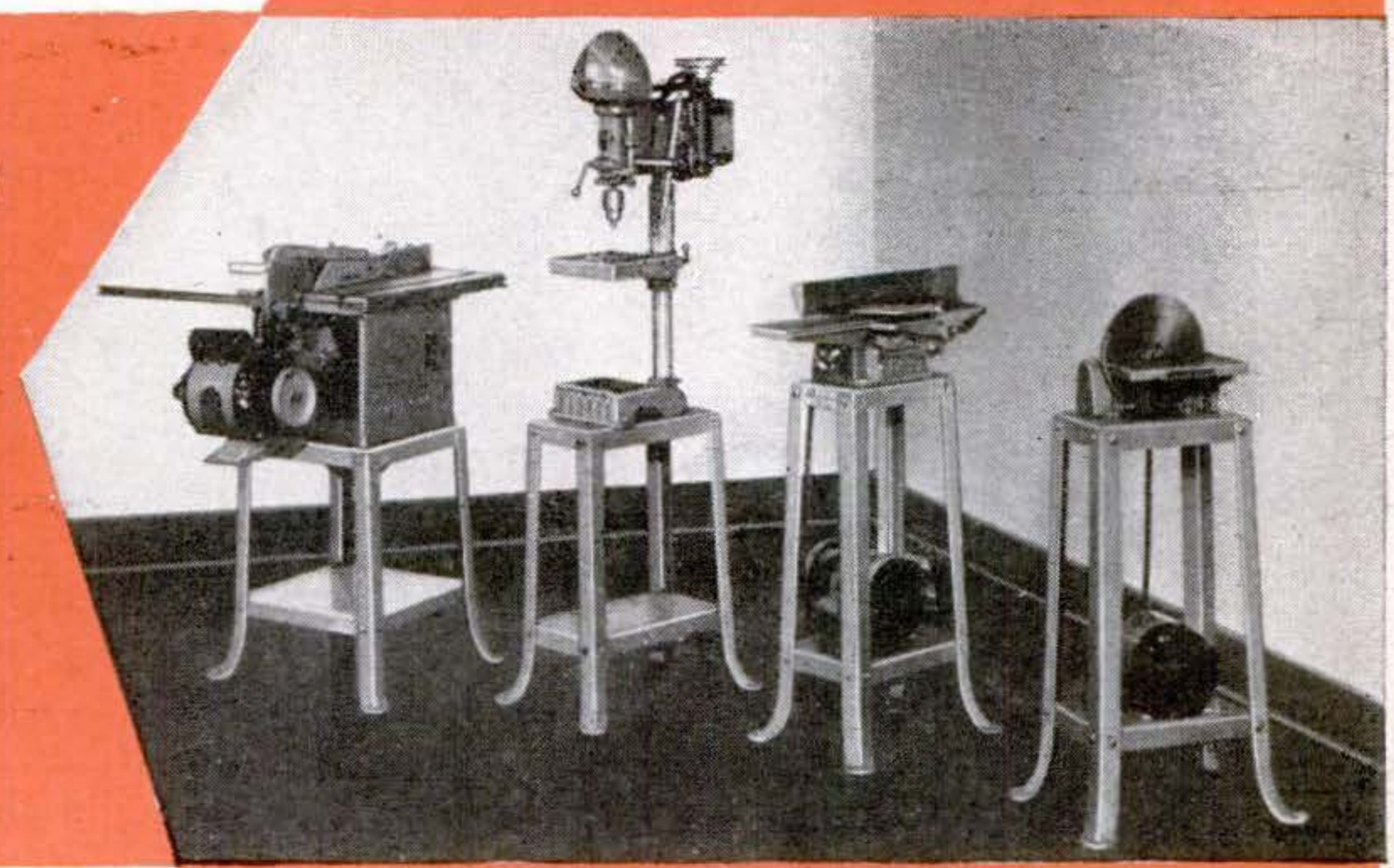
...THE *Only* WAY TO HAVE

THE RIGHT BASIC TOOLS IN 1 COMBINATION UNIT

the DELTA'SHOP





Many long-awaited features distinguish this revolutionary new 3-foot square, one-motor combination tool that does 98% of home repair and improvement jobs. For example:

the *Only* combination of Individual "MUST" tools Basic Delta tools, ready to do the work they are designed for—in the normal sequence of operations—without wasting time on set-ups and adjustments.

the *Only* combination tool built around a tilting arbor circular saw The most-used tool is your saw—on the DELTASHOP, it's a rugged machine—and, the blade tilts, not the table.

the *Only* combination tool with a true jointer As soon as you saw a board, you need a jointer—the only fast, easy way to get a true edge. Circular saw and jointer are a natural team.

the *Only* combination tool you can change to individual tools As your shop expands, you may want individual tools. Only your DELTASHOP makes it possible—no loss of your original investment.

the *Only* combination tool you can assemble "a tool at a time" Get these basic tools one at a time and combine them later into a one-motor unit.

the *Only* combination tool that gives so much for so little This unbeatable unit can be yours for ONLY $209.95*—complete with steel stand. Your Delta dealers' easy payment plan makes it a pleasant and painless purchase.

*Motor and motor accessories extra.

- A complete drill press—does mortising, carving, shaping, cuts mouldings and many others, in addition to drilling.
- A big-capacity jointer—makes a true, "finished" edge in one swift pass; planes boards up to 4" width, makes old pieces like new.
- Big, rugged circular saw with *tilting blade*, safest, most accurate type of saw: cross-cuts, rips, bevels, miters, every sawing job.
- Handy disk sander puts a satin finish on any surface, curved or flat; also grinds, buffs, polishes—a tool of many uses.

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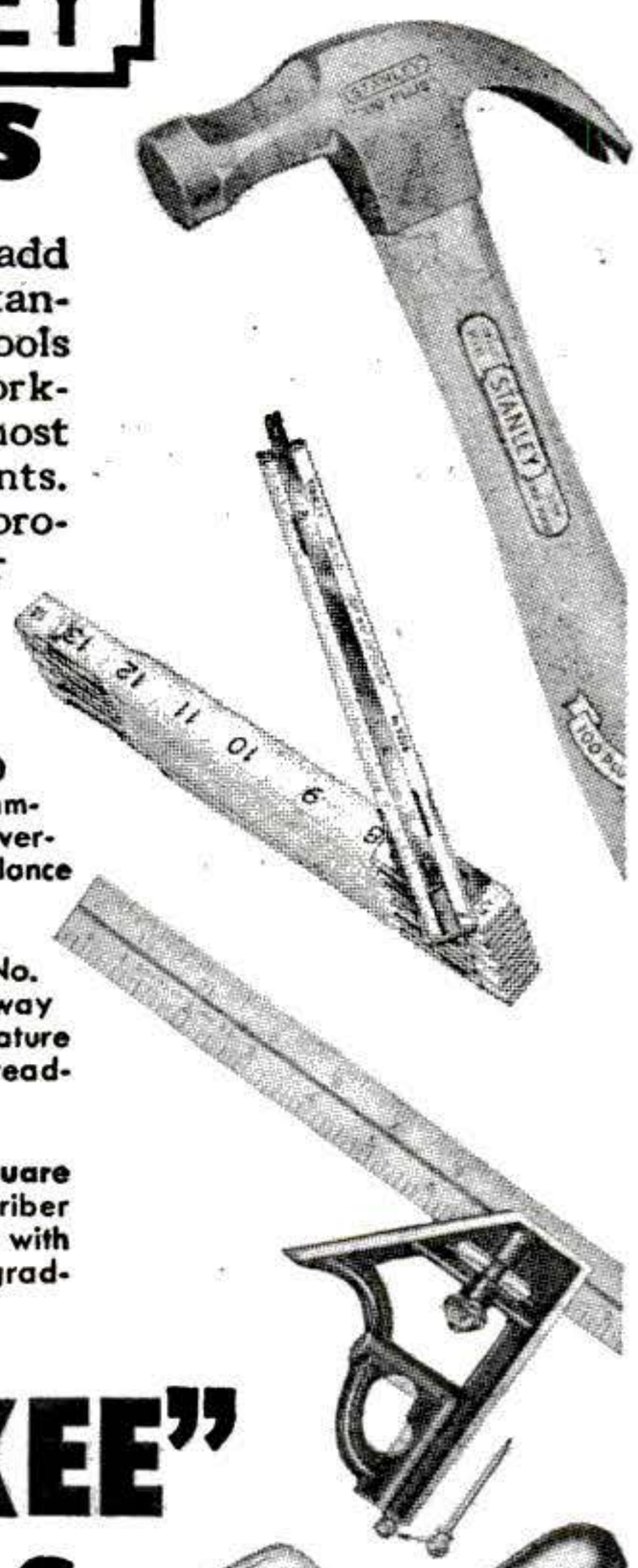

Have more fun — add these top quality Stanley and "Yankee" Tools to your tool box or workshop and make the most of your time and talents. They're designed for professionals, priced for the occasional user. See them at your dealer's.

Stanley Nail Hammer "100 Plus"—The Aristocrat of hammers. Alloy Steel Head. "Ever-tite" hickory handle. Power balance for perfect driving.

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"Yankee" Push Drill No. 45. Ideal for craftsmen, hobbyists and handymen . . . makes quick work of boring small holes. Complete with 8 drill points in full view magazine handle.

"Yankee" Spiral Ratchet Screw Driver No. 130A. Fast worker for driving or drawing screws — saves time and muscle. Quick-return spring repositions handle automatically.

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How We'll Live on Mars

[Continued from page 162]

sure suits and enter its artificial, pressurized atmosphere. Then they proceed with setting up the interior fittings.

Will Be Anxious to Explore

They will not long be satisfied to remain holed up in their base, but will be impatient to fare forth and explore the planet.

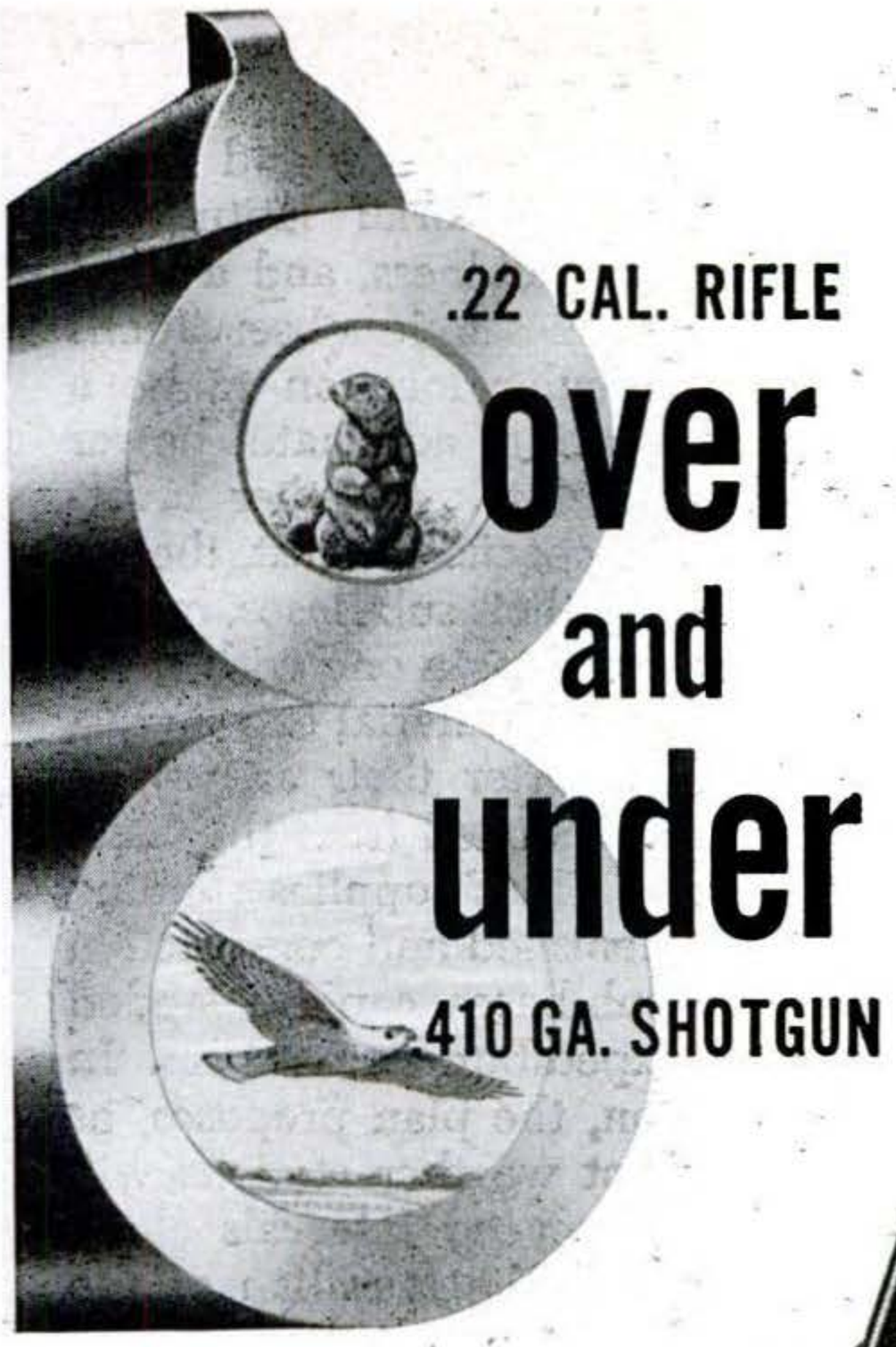
Mars is believed to be relatively smooth —with no discernible mountain peaks, and variations in height of probably no more than 2,000 to 3,000 feet. On foot, the explorers should be able to reconnoiter the flat terrain to considerable distances from their base camp. The low gravity on Mars—which has only half the Earth's diameter and 1/10th of its mass —will lighten the load of their oxygen and pressure gear. The explorers and their trappings will weigh scarcely more than one-third as much as on Earth, and they can bound along with giant strides.

Engines Need No Air

Vehicles of special design may take them farther afield, plans for the expedition suggest. Granted that lack of oxygen for combustion rules out conventional engines, possible expedients remain—for example, a power plant burning fuel oil and hydrogen peroxide, which would furnish the needed oxygen. Units of this sort could drive several small tracked land vehicles and, also, airplanes needed for transportation between the main base and advance subbases set up later. Since the low lifting power of the rarefied Martian atmosphere is only partly countered by the low gravity, airplanes would need wings of four times' normal area; but there is little doubt that such craft could function on Mars. Flights would skim the planet's surface, giving a good view and avoiding the difficulty of climbing into still thinner air.

A site proposed for the main base, from which these excursions would radiate, is at 20 degrees south and 350 de-

[Continued on page 264]



The famous all-purpose gun! SAVAGE MODEL 24

The choice of *either* an accurate .22 cal. rifle or a dependable .410 gauge shotgun is yours—*instantly*—when you're afield with the Savage Model 24 over-and-under.

It's the most versatile gun on the market today—ideal for fun, fur or feathers. Use the accurate .22 cal. *upper* barrel for plinking, informal target shooting or small furred game. Then, with a flick of the thumb, the dependable .410 ga. *lower* barrel is ready for flying pests, game or targets.

The Savage Model 24 "over-and-under" is as compact, lightweight, streamlined and good looking as it is practical—the perfect many-purpose gun for use on the farm, at camp, or for all-around utility. See it at your dealer's. Write for catalog of Savage, Stevens and Fox shotguns and rifles.

A lightweight, rugged, many-purpose over-and-under gun. Upper barrel shoots all .22 cal. rimfire cartridges; lower barrel, .410 shot shells. Single trigger. Single sighting plane. Selector button permits instant choice of either barrel. Two-way top opening lever. Walnut stock. Takedown.

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Firearms Division Chicopee Falls, Mass.

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If You Make Painting a Hobby-

You'll get a lot more real satisfaction and pride of ownership out of a home that is clean and neat and trim in a fresh coat of paint! Pays its own way by improving your property, too!

Because Archer Pol-mer-ik contains polymerized oil, it gives you a tougher, more durable paint film than ordinary linseed oil. When you reduce your paints with Pol-mer-ik, they brush easier, level better, and give you a smoother, dirt-resisting finish. Wonderful brush conditioner, too!

Handiest single product in your house or shop. Does the job of a dozen specialized products. A few of

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PROTECTS MOST EVERYTHING

How We'll Live on Mars

[*Continued from page 262*]

grees west, Martian latitude and longitude. The near-equatorial latitude is dictated by Mars' coldness, and a wind map based on telescopic observations shows this particular location to be a windy one, assuring adequate power from wind generators. At other favorable locations of special interest, the explorers will set up their sub-bases, miniature versions of the main one with room for six men apiece. Material can be dispatched to them after their arrival, in guided missiles launched from the Mars satellite station. Thus, supplies running low can be replenished and construction materials for sub-bases can be landed wherever the expedition wants them. In the same fashion, the plan proposes, as many as 46 robot weather stations will be set down at spaced intervals along Mars' equator and the meridian of the main base, and will automatically transmit their instruments' readings to it by radio.

Astronomy Sets Return Date

And so the main base would be a beehive of activity—receiving radio reports from advance parties and automatic weather stations, and studying photos and animal, vegetable or mineral specimens brought back—up to the moment chosen for the return journey.

Relative positions of Mars and Earth will be most favorable for a return trip just 449 days after the outbound space voyage. The planned stay on Mars of 430 days, mentioned earlier, provides an extra 19 days "allowing time for the group to be transferred back to the orbital ships for the return trip."

This plan leaves open the mechanics of getting the party back to the Mars satellite. The Mars base may be dismantled and its central cylinder reconverted to a rocket ship. Or a completely new ship may be assembled out of parts dispatched from the satellite station.

Of course the success of this venture of the future will depend upon the most

[*Continued on page 266*]

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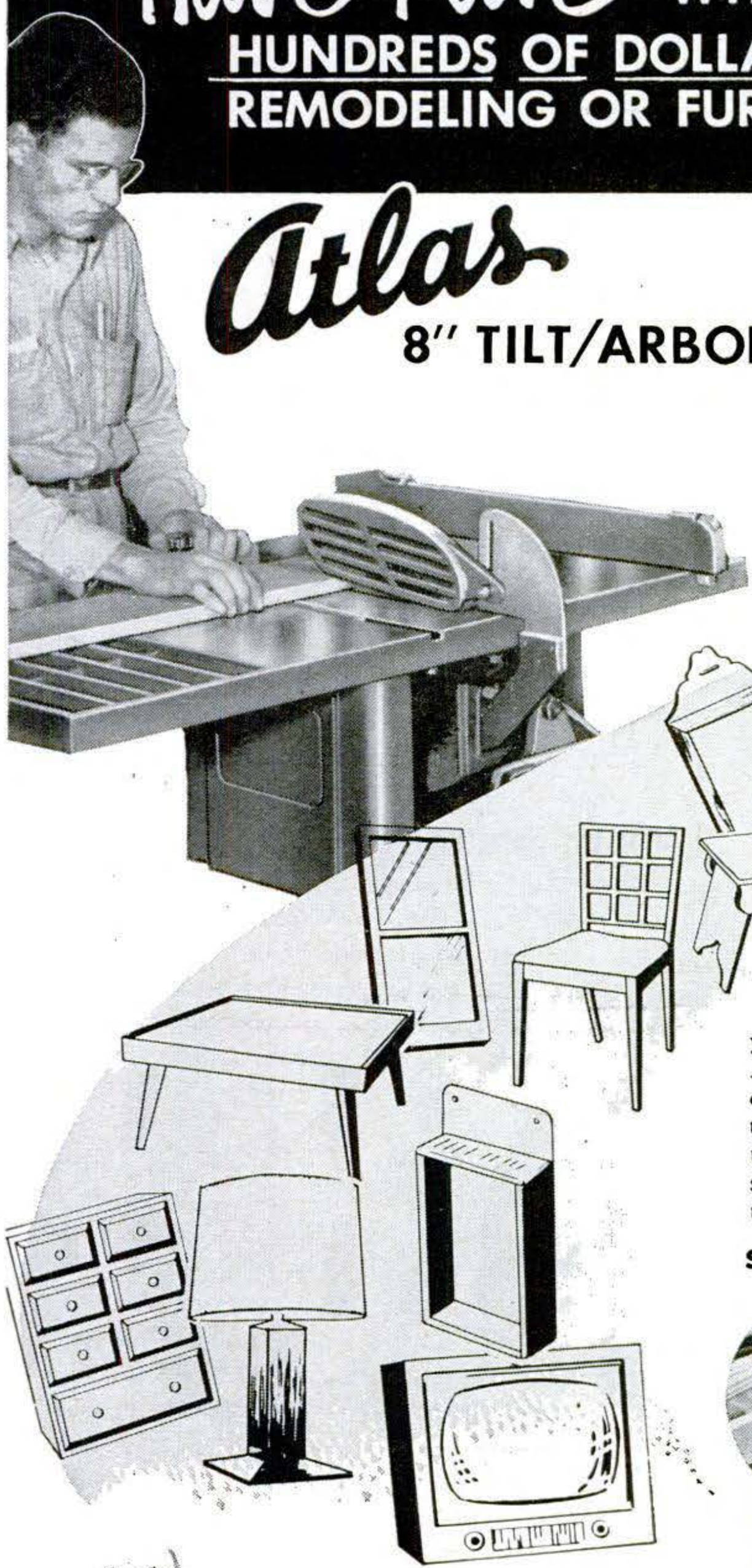

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SHAPES! DADOES! CUTS TENONS!

Equip your Atlas saw with low-cost moulding head and cutters, and you're set to handle *joinery, dadoes, shaping for cabinets, windows, doors, trim!*

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Original furniture designs by a nationally recognized authority. Step by step instructions and plans, all thoroughly tested. Finest book of its kind ever produced — only 50¢ postpaid, 65¢ outside U.S.A.

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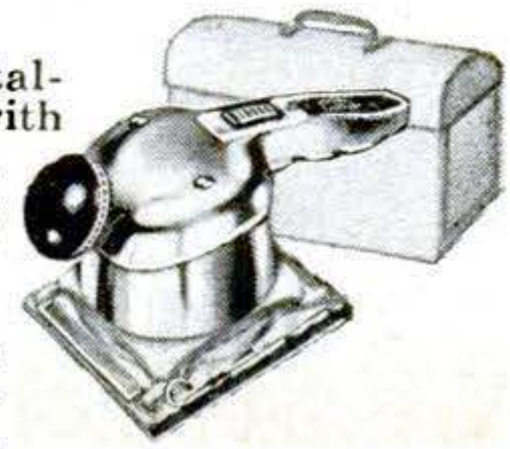
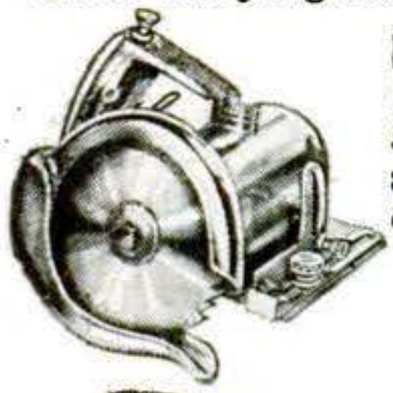
No. 150 SpeedSander
An all-ball-bearing, orbital-motion, finishing sander with powerful 3450 r.p.m., A.C. induction motor and cast aluminum body. **$34.50**

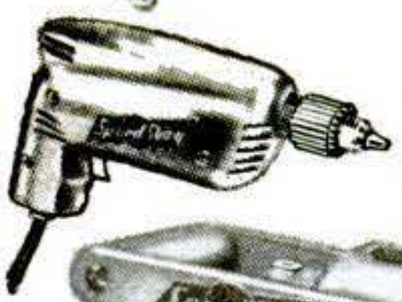


150-K SpeedSander Kit
The Sander with Accessories including: deep contour pad, finishing plate, felts for free abrasives and wet rubbing, lamb's wool bonnet, 90 sheet abrasive covers, etc. in fitted steel carrying case. **$49.50**



No. 1000 SpeedSaw
¼ H.P. Universal Motor, cast aluminum housing, safety shut-off switch. Cuts all angles to 45°, any depth to 1⅛" **$29.95**

SpeedDrills
(for metal or wood)
Extra power, high speed, electric drill with cast aluminum cases, and geared chucks.



No. 200-J ¼" SpeedDrill $19.50
No. 400
½" SpeedDrill $39.50
also other sizes, types.

Drill Kits
Several fast selling kits. Painters and Householders Kit (illustrated) is typical. It has: ¼" Hornet Drill, Abrasive Discs and rubber backer plate, grinding wheel, wire brush, buff, etc. In attractive display carton. **$19.95**

Write for catalog

SpeedWay MANUFACTURING CO.
1864 So. 52nd Ave. • Cicero 50, Illinois

How We'll Live on Mars

[Continued from page 264]

elaborate preparation. And hitches can occur despite the best of planning. On Earth, construction delays caused by unexpected bugs are merely irksome; on Mars, they may be fatal. Everything has got to click.

And so the initial landing on Mars must necessarily be an adventure fraught with the utmost peril. But if history repeats itself, there will be no dearth of volunteers, prepared to gamble their lives to advance the frontier of human knowledge. END

The Final Blow

AT A recent shipyard launching, the woman who was to christen the ship was nervous. The shipyard manager asked her if she had any questions.

"Yes," she replied. "How hard do I have to hit the ship with the bottle to knock it into the water?"—*L & N Magazine.*

Uncle Sugar Changes Name

STATESIDE, or the U.S., was Uncle Sugar to World War II GIs—Uncle for the letter U and Sugar for the letter S. A new phonetic pronouncing alphabet for air-ground communications recently adopted by the International Civil Aviation Organization now makes it Union (U) Sierra (S).

Here is the new alphabet:

A—Alfa; B—Bravo; C—Coca; D—Delta; E—Echo; F—Foxtrot; G—Golf; H—Hotel; I—India; J—Juliett; K—Kilo; L—Lima; M—Metro; N—Nectar; O—Oscar; P—Papa; Q—Quebec; R—Romeo; S—Sierra; T—Tango; U—Union; V—Victor; W—Whiskey; X—Extra; Y—Yankee; Z—Zulu.

Phonetic numerals do not exactly follow the king's English:

0—Ze-ro; 1—Wun; 2—Too; 3—Tree; 4—Fow-er; 5—Fife; 6—Six; 7—Sev-en; 8—Ait; 9—Nin-er.

There are no words for 10 or 100. It's Wun Zero or Wun Zero Zero. For 1,000 it's Tousand.

The new alphabet words, ICAO experts claim, are pronounced with much the same sounds in almost all languages. The Civil Aeronautics Administration also has adopted the system, but points out that it is not mandatory. It is expected that the military services will go along.

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IDEAL FOR HOME CRAFTSMEN...

PRECISION
SHEET METAL WORK

with **TRU-CUT®** SNIPS

Proved in aircraft plants to be best for cutting metal accurately to guide lines of any simple or complex pattern. Now available for home workshops.

- exclusive tension washer maintains uniform tension on cutting edge for precision accuracy.
- lightweight, powerful, sturdy
- cuts 20 gauge sheet metal
- exclusive no-pinch handles
- cuts perfect circles left or right
- cuts square points left or right
- cuts straight work faster, easier
- 2½" blades
- 12" overall
- wt. 2 lbs.

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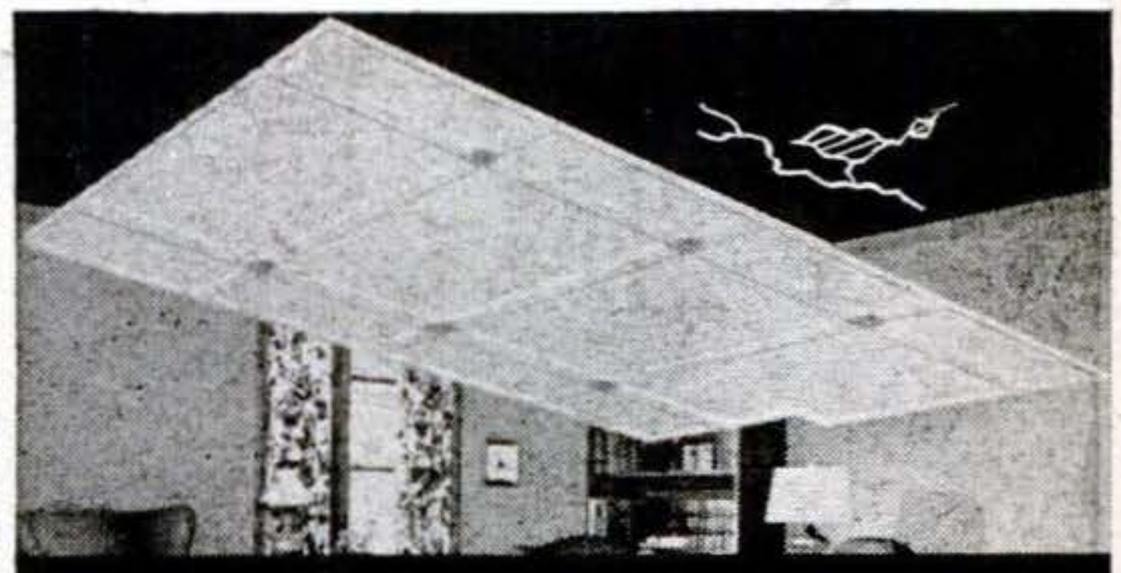

CEILINGS CRACKED? NEED MORE ROOM?
WANT TO *Modernize* YOUR HOME?

Do the job easily, quickly at low cost with
UPSON PANELS
or CEILING TILE

For Cracked Ceilings:
No messy replastering! No ordeal of housecleaning! Apply **Upson Kuver-Krak Panels** on furring strips right over old plaster. Unique floating fasteners eliminate face nailing. Waterproofed and washable, **Upson Ceiling Tiles** are 12-in. sq., applied with matching color pins! Both give you a beautiful new crackproof ceiling in a matter of hours!

For Modernization:
Upson Panels saw like wood. Take screws, nails, fixtures. Available in a variety of widths, thicknesses and surfaces—at your lumber dealers! **Strong-Bilt Panels** for new construction, 3/16" panels for lighter work. Pebbled or smooth surfaces—plus new **Striated Panels** for a modern look! Trademarked for uses.

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Beautify your fireplace

Extra closet in bedroom

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I enclose 10c for 32 page Idea Booklet. Include Instruction Sheet for applying Upson Ceilings and working drawings for Storage Wall FREE.

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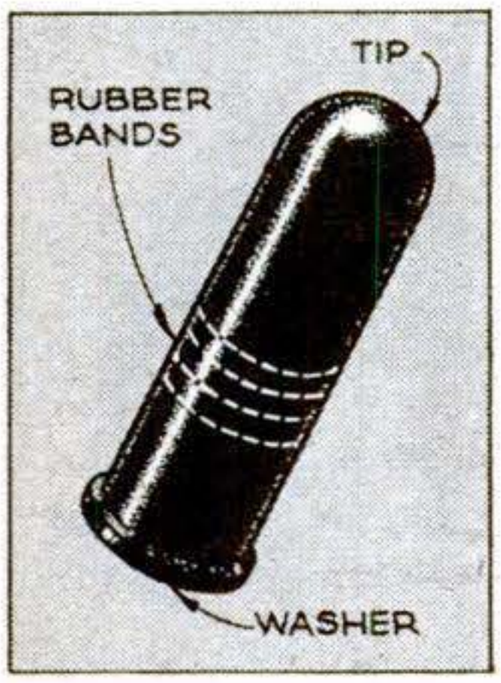
Guy and Dolly Handle Heavy Stones

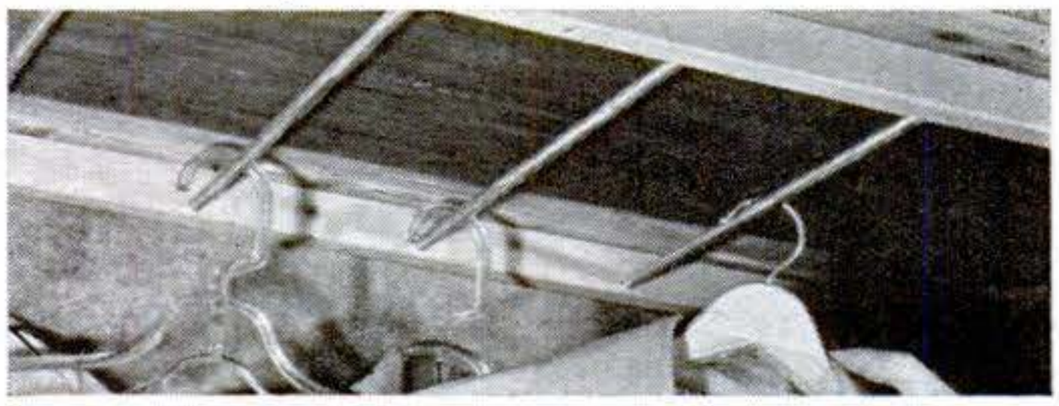
It was a case of paying $15 a ton for building stone or collecting the stones myself. That's why I built this winch-equipped dolly. The bed of 1½″ oak rolls on 10.50 by 4 pneumatic tires. For the crane, I used ⅛″ by ½″ by 2″ channel steel with two pieces bolted back to back for each leg. The winch has a 30-to-1 ratio and is rated at 1,000 pounds.—*Scott Seegers, McLean, Va.*

Uses for Eye-Dropper Bulbs

When you clean out the medicine cabinet, save those old eye droppers. The cut-up rubber bulbs can be used for lots of things, as shown in the drawing. The little shoulder on the end becomes a washer, the tip, a pad for a small object. Rubber bands can be cut from the bulb, and it can also be used as an insulator in a radio or other electrical device. —*Frank Shore, NYC.*

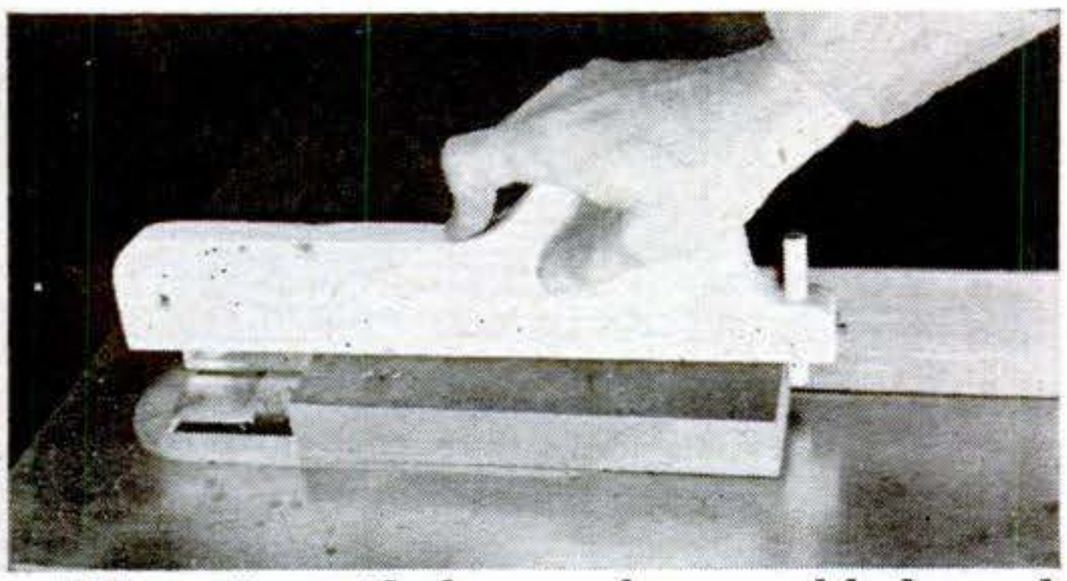


Rods Improve Shallow Closet



When a closet is too shallow to handle hangers on a conventional clothes pole, a number of rods may do instead. Locating the rods close together—say, every 6″—lets you stagger the hangers and makes stored clothes easier to see and reach. The ⅜″ rods are supported by two parallel wooden strips. —*Walter E. Burton, Akron.*

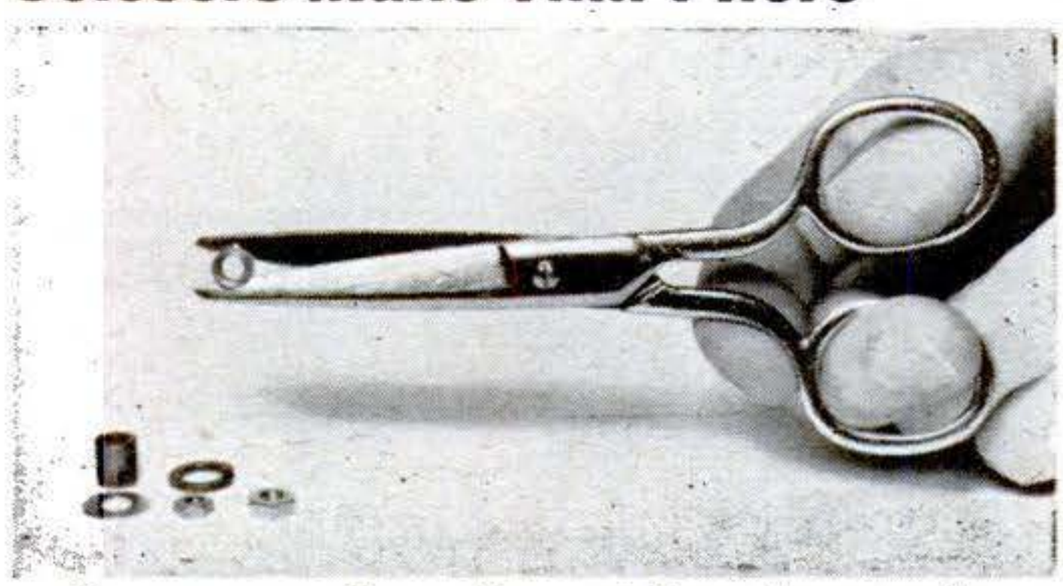
Push Stick Holds Work on Saw



Work is guided past the saw blade and held firmly against the table surface by this adjustable push stick. The ⅜″ dowel at the rear of the jig is held in place by a wood screw and can be raised or lowered for stock of various thicknesses. Should the blade cut into the dowel when ripping thin slices, no harm is done and it can be quickly replaced.

The pusher is made from ¾″ or thicker lumber.—*Walter Haase, Hartford, Conn.*

Scissors Make Thin Pliers



Reaching deep into tight places where your fingers or ordinary tweezers can't quite make it, an old pair of scissors with V-shaped notches filed near the tips becomes an indispensable tool for fine assembly work. Small nuts, washers and screws can be easily handled and placed. The scissors can still serve their original purpose as shears because cutting is nearly always done near the pivot screw.—*Arthur Trauffer, Council Bluffs, Iowa.*

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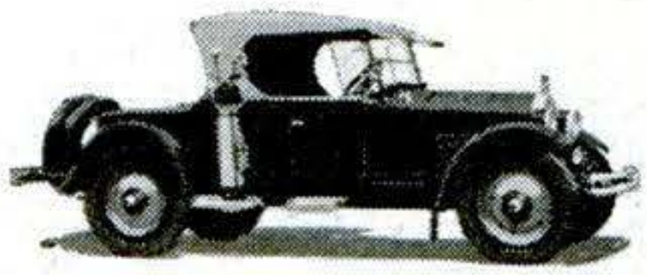
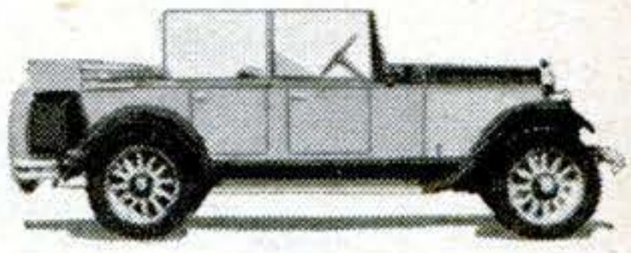
OLD FRIEND OF OLDSMOBILE

1911 Autocrat Roadster



1921 V-8 Sport Roadster



1927 De Luxe Touring

1930 Convertible Roadster

1936 Convertible Coupe

1947 Convertible Coupe

AC Spark Plugs are Original Equipment on nearly as many new cars as all other makes combined

AC Spark Plugs have been used on every Oldsmobile since 1911. And AC engineering advancements have kept pace with today's high-powered, high-compression engines like the 1953 "Rocket." These modern ACs have insulators of patented *CORALOX,* the material that has made all previous types of insulators obsolete.

CORALOX gets hot quicker to burn away oil and wet carbon deposits . . . resists the deposits of oxide coatings from fuels . . . stays clean longer . . . provides 4 times greater heat conductivity . . . has 3 times the mechanical strength . . . 10 times greater electrical resistance at high temperatures. These outstanding CORALOX advantages mean:

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ORIGINATORS OF IMPACTOOLS—AIR AND ELECTRIC

5,000 Railroads Run for Fun

[*Continued from page 102*]

ball rolling when they simplified the outward appearance of the locomotive with their Diesel engines. Roomy cabs make it possible to hide a powerful little gasoline engine in a small scale model, and apart from some form of reversing gear and a chain drive to a set of trucks, that was all the would-be garden railroader was waiting for.

Not that all Diesel-locomotive models are bargain-basement buys. The ones used by the amusement parks, today, often cost as much or more than a comparable steam job. At least one such model, built by Lawrence W. Sauer of Minneapolis and operated in Minnehaha Park, represents 27 months of full-time work.

Convincing Diesel Locomotive

But Casey Jones Jr. doesn't have to worry about hauling revenue loads. With a small, one-cylinder gasoline engine, some exterior plyboard and a little ingenuity, he can turn out a very convincing Diesel locomotive for less than the cost of an assembled O-gauge model.

Probably his biggest headache is the reversing and speed-control hookup to the wheels. In Bath, Pa., an auto dealer is marketing a simple device for buyers who are willing to limit their Diesel output to one horsepower. This is a friction spool with a reverse-lever throw and a chain drive to the axles. In addition, Robert E. Miller offers castings for two types of locomotive trucks and running gear for a number of freight-car types.

It all adds up. The garden railroad is about as far advanced, today, as indoor model railroading was in 1940. And this pleases the real craftsman. He doesn't want construction kits that you can shake together. It's more fun to say:

"I built this baby up from the grass roots." END

Simple Explanation

Policeman: "How did this accident happen?"
Motorist: "My wife fell asleep in the back seat."—*L & N Magazine.*

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Sportsmen Rally to the "Action Test" Ride

PERFORMANCE MAKES

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MERCURY

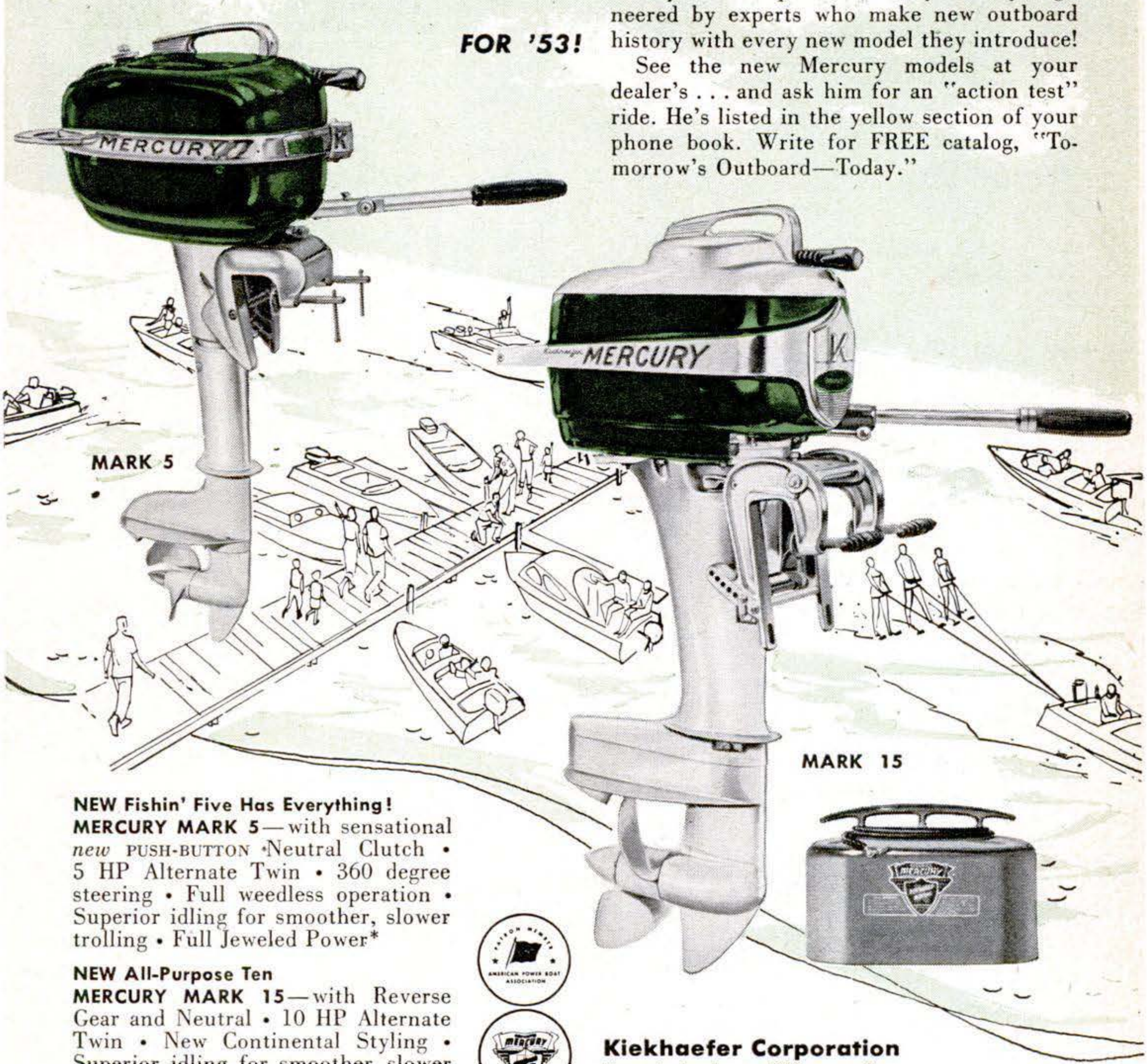
AMERICA'S MOST-WANTED OUTBOARD

FOR '53!

Take an "action test" ride with any of the five magnificent Mercurys for 1953! *Feel* the surging, singing power as you crack the throttle. *Listen* to the soft-throated murmur of Mercury's sweet-running powerhead as you sample its new superior idling speeds. *Thrill* to the quick-responding performance *only* a Mercury can deliver!

Then *choose* the outboard that's "most wanted" in America, according to independent surveys. Move *up* to a Mercury—safety engineered by experts who make new outboard history with every new model they introduce!

See the new Mercury models at your dealer's . . . and ask him for an "action test" ride. He's listed in the yellow section of your phone book. Write for FREE catalog, "Tomorrow's Outboard—Today."



NEW Fishin' Five Has Everything!
MERCURY MARK 5—with sensational *new* PUSH-BUTTON Neutral Clutch • 5 HP Alternate Twin • 360 degree steering • Full weedless operation • Superior idling for smoother, slower trolling • Full Jeweled Power*

NEW All-Purpose Ten
MERCURY MARK 15—with Reverse Gear and Neutral • 10 HP Alternate Twin • New Continental Styling • Superior idling for smoother, slower trolling • Equipped with 6 gal. remote fuel tank • Full Jeweled Power*

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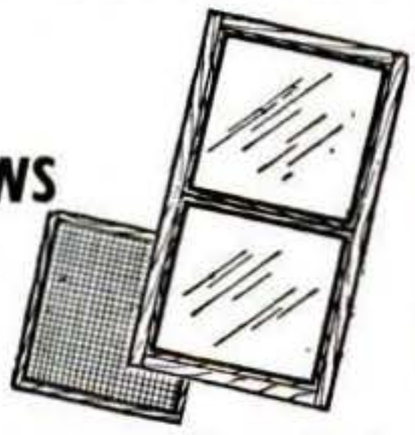
Assemble and Install Buckeye Screen and Glass Combination STORM WINDOWS

(Glass and screen panels are interchangeable in summer and winter)



Install 10 Combination Storm Windows—Make $100.00 Profit! You Pay Only $6.65

for a redwood combination storm window to fit a house window 28½"x56½" (Screening and glass not included)

- **Shipped In Knocked-Down Form.**
- **Tens of Thousands Already Sold.**
- **Either Redwood or Aluminum Types.**
- **No Finer Quality Available.**

Here's your golden opportunity to turn spare hours into big money! In just a few hours a day you too can make more money than you ever dreamed possible—in both summer and winter—assembling Buckeye Combination Storm Windows.

Imagine making $10.00 or more on every Buckeye Combination Storm Window you can assemble and install! Yes, that's the kind of clear profit you can make. Assemble 10 windows, make $100.00 (about 7 hours time after a little experience).

This is no get-rich-quick-scheme but a legitimate, sound way for you to make additional money in your spare time. You risk nothing—no tools to buy, no big inventory needed. Just order storm windows as orders pour in.

We have been in business twenty years, sold tens of thousands of these top quality redwood or aluminum storm windows. Our reputation is your guarantee of quality.

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Yes, Buckeye Storm Windows are approved by FHA (Federal Housing Authority). You or your customers can pay as little as $5.00 a month for their storm windows, take up to 36 months to pay! No down payment. Your local bank will be pleased to give you full information.

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A Dry Basement

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Only $218 less motor f.o.b. plant. Ship. wt. 400 lbs.
PAY AS YOU EARN!
small down payment
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USE DREMEL STRAIGHT-LINE ACTION SANDERS

Only Dremel Offers All These Features:

WORLD'S FINEST FINISHING SANDERS—Patented Straight-Line Action sands with the grain of the wood—eliminates cross grain scratches and orbital swirls.

MORE SANDING SURFACE PER DOLLAR means more work done. Faster action (14,400 sanding strokes per min.); more than *three times* as fast as other type sanders!

POWERFUL, high-speed, lifetime reciprocating motor (110 V. 60 cycle A.C.).

EASY, ONE-HAND OPERATION less tiring on vertical and overhead operations. Sands into corners—other tight places.

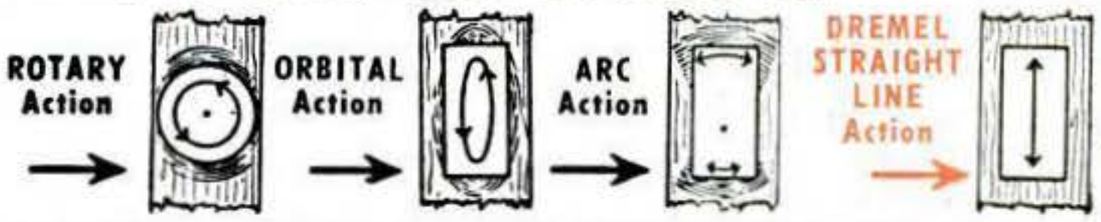
TROUBLE-FREE USE assured. Only two moving parts; never needs oiling. No armatures, brushes, gears or bearings to wear out and replace.

FREE SANDING GUIDE

A handy, 16-page "How-to-do-it" booklet containing helpful hints on sanding and refinishing procedures packed FREE with each Dremel Sander. Extra copies, 25c.

MAKE THIS SIMPLE TEST!

Sand a piece of wood, by hand, using the four different sander motions illustrated below. Note how the slightest cross-grain action produces scratches and swirls . . . how sanding **with-the-grain** leaves a scratch-free, satin finish. This test proves conclusively why professional craftsmen **always** sand with the grain of the wood . . . never cross grain. YOU BE THE JUDGE! If you are not 100% convinced that Dremel straight-line action is the finest, most effective sanding method known, we sincerely don't want you to buy.



MODEL 2000

Heavy-duty model; 21 sq. in. (3⅛"x7") sanding base. Price includes sturdy steel storage case, 25 asst'd. abrasives, 1 polishing pad. **$24.50**

MODEL "A"

Hobby and household model sander, polisher, massager (above, right); 12 sq. in. (2⅜"x5⅜") sanding base. Price includes 6 abrasives; 1 polishing pad, 1 massage pad. **$14.85**

A "must" for sanding dry-wall joints.

Fast—cuts refinishing time in half.

Sands right into tight corners.

Prepares furniture for repainting.

A Rugged Tool for Home and Shop
DREMEL Electric MOTO-SAW

Here is a genuine craftsman's tool with dozens of household and workshop uses. It is perfect for all sorts of coping and jig saw work making window valances, knickknacks, hobby projects, etc. High-speed, reciprocating-type motor easily cuts asphalt and rubber tile, also masonite and formica—wood up to ¾". Perfectly safe for children—so easy to handle that women love to use it. Has only two moving parts, never needs oiling. A high quality tool used by craftsmen, tile layers, and carpenters.

"A TOOL THE WHOLE FAMILY CAN ENJOY"

Cuts scrolls like magic!

SEE YOUR LOCAL DEALER: Dremel Tools are sold at better dealers everywhere. If your dealer can't supply, order direct on a five-day trial, money-back guarantee. Remit in full, and we will ship postpaid. Or, send only $2.00 now, pay postman balance plus postage and C.O.D. fee.

DREMEL MFG. CO. Dept. 123-C RACINE, WISCONSIN

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$1,000.00 CASH ENTER

SYNCRO SANDER CONTEST

IT'S FUN! IT'S EASY!

NOTHING TO BUY!

HOW TO ENTER:

1. Don't buy anything—just find correct Missing Words for Jingle:

SYNCRO SANDERS HAVE A LOT OF FEATURES OTHERS HAVEN'T GOT; S___R, L___R, ___-FREE PLUS AN HONEST _____EE!

"Missing Words" are below sander picture *in the type* following "Syncro Features." Look for them now!

2. Finish Sentence "I LIKE SYNCRO SANDER BECAUSE" in 15 additional words or less.

3. Give hardware store name.

ENTER NOW! Write completed Jingle, Sentence, store name, your name-address on paper—mail! OR send Coupon for FREE CONTEST FOLDER—or get at hardware store! Have fun—and win!

WIN One of These 43 CASH PRIZES

★

1st Prize $500

2nd Prize $200

3rd Prize $100

40 Prizes $5 Each!

★

Contest STARTS MARCH 1 ENDS MAY 31, 1953

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SYNCRO FEATURES:

Sands 10 times faster than hand-sanding. SMOOTHER finish, too! Proven best for vertical and overhead use because it is so powerful, so much LIGHTER. Syncro is the only electric sander with Double-Arc motion which cleans as it sands. Works so easily you "finger-guide-it!" Save money and TROUBLE doing your own refinishing at home with Syncro. Remember—it is the only sander giving you a GUARANTEE which says: *Syncro Power Units guaranteed against burn-out all during your ownership or replaced free!* Try SYNCRO at your hardware!

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$1,000.00 Contest Folder FREE AT HARDWARE OR SEND COUPON

Warning to Space Travelers: Beware of These Odd Hazards

WILL "space sickness," a malady new to medicine, imperil future voyagers to other planets? A warning of that possibility was given at a recent New York symposium on space travel by Dr. Heinz Haber of the Air Force School of Aviation Medicine.

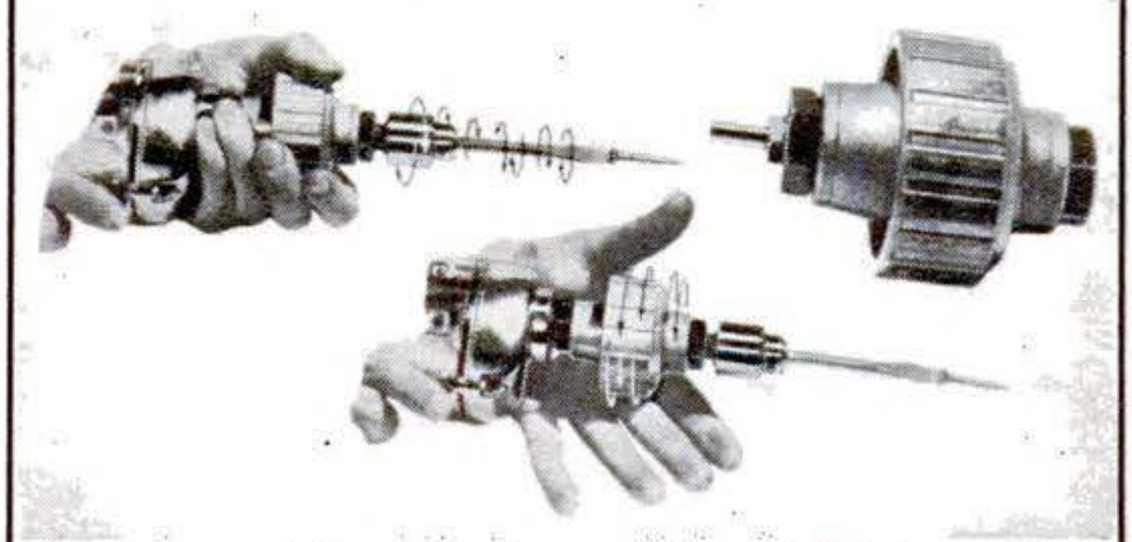
Within a space ship, the normal pull of the earth's gravity will vanish, and occupants will become weightless. How well and for how long the body can adapt itself to this strange situation—impossible to duplicate on earth—is unknown.

A form of seasickness, Dr. Haber points out, might result from the conflict of unaccustomed physical sensations with the normal evidence of human senses. Whether or not a serious ailment in itself, this "space sickness" could cause grave danger if it incapacitated the crew of a space ship and left controls untended at a critical moment in a flight.

In case prolonged weightlessness does harm the body, designers of space ships may still be able to overcome the difficulty. A rotating cabin could substitute centrifugal force for natural gravity. This "artificial-gravity" idea was recently incorporated in a proposed design for a revolving, doughnut-shaped inhabited "space platform" to circle the earth as a satellite.

Bombardment of a space ship by tiny meteors, which could puncture the skin and drain the cabin of life-sustaining air, is another possible hazard of interplanetary flight.

BABCO 5-TO-1 SPEED REDUCER FOR 1/4" ELEC. DRILLS



Convert your drill to electric screwdriver—drill holes to 1¼" in wood, to ½" in masonry. Planetary gear system gives tremendous torque increase. Adapters furnished for ¼" or ½" chucks. Instant starting or stopping with hand clutch control. To start, simply grip reducer, release to stop. At hardware stores and tool dealers, or $9.95 ppd. from Babcock Mfg. Co., 6259 Claremont Ave., Oakland 18, California.

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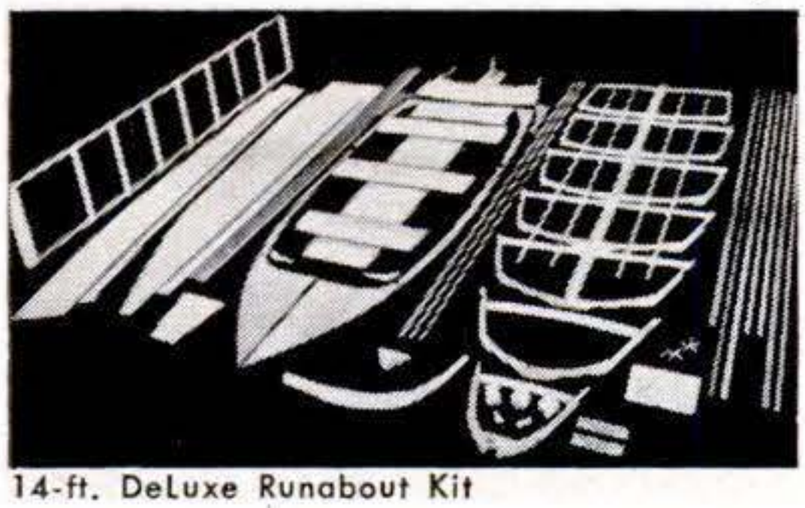

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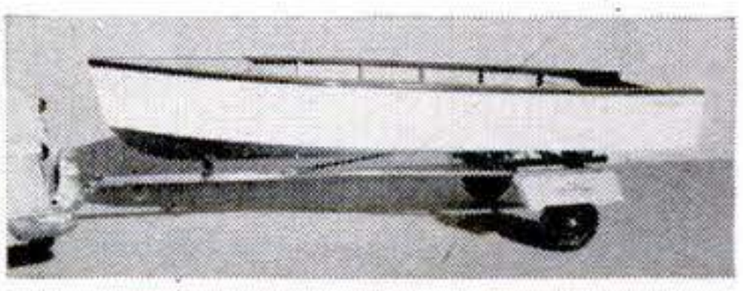

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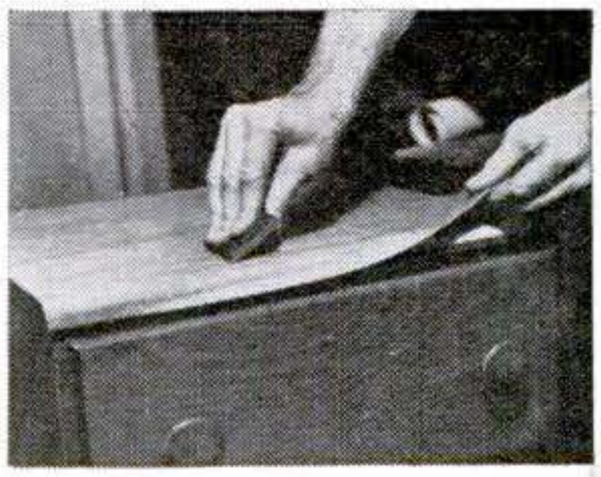

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[Continued from page 177]

costly, accounts for today's resilient and perfectly banked oval. It is a far cry from the first track, erected in the Chicago Coliseum in 1935.

"It was a lulu," Seltzer recalls. "Skaters raced for speed along the straightaway, hit the shallow banks and took off for points in the bleachers. We had to do something about that baby, but fast."

Banking Track Cuts Accidents

Seltzer called for timbers, screw jacks and a bucket of pumice. The offending corners were jacked up until skaters, traveling at top speed and marking their courses on the powdered pumice, passed no nearer the rail than one foot.

It was also found that ordinary rink skates, which have a side-tilt of only 10 degrees, wouldn't work on banks sloped to 23 degrees. Players seemed to be going around the oval on a 13-degree slant. So Seltzer and his brother Oscar promptly bought a skate company and fashioned a Derby model with 45-degree tilt.

Like the Chicago packer who learned to market everything in a pig but the squeal, Seltzer has exploited every aspect of Roller Derby except the roar of flying wheels. Filmed games are being sold to TV stations in 24 cities. The skate business is swelling his personal Fort Knox, and a biweekly fan newspaper, *Roller Derby News*, has 50,000 readers. END

Taking the Long View

Two cars met in a head-on collision. Both drivers got out and began to apologize.

"I'm so sorry," said the woman. "It was all my fault."

"Not at all, madam," the man responded with gallantry. "I was to blame myself."

"But I was on your side of the road."

"That may be true, madam, but I am responsible for the accident. I saw you coming three blocks away and had plenty of time to turn down a side street."—*Pure Oil News.*

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LESS MOTOR $249.95

it's a circle saw, drill press, sander, router, shaper, lathe

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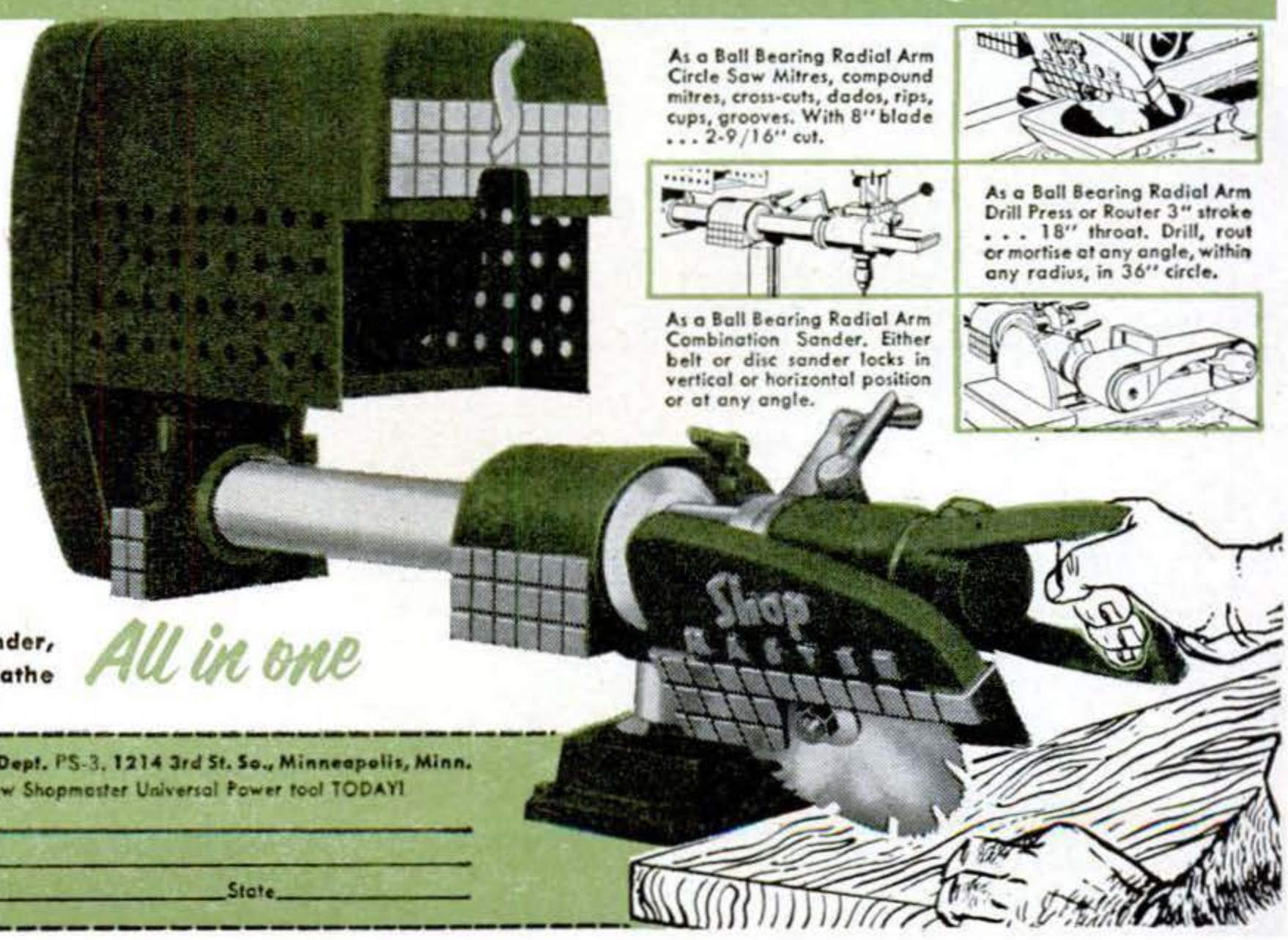

As a Ball Bearing Radial Arm Circle Saw Mitres, compound mitres, cross-cuts, dados, rips, cups, grooves. With 8" blade . . . 2-9/16" cut.

As a Ball Bearing Radial Arm Drill Press or Router 3" stroke . . . 18" throat. Drill, rout or mortise at any angle, within any radius, in 36" circle.

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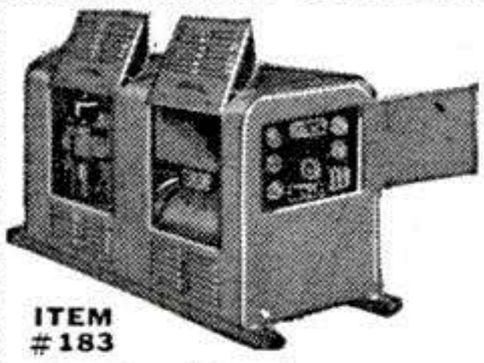

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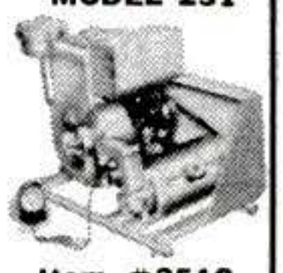
MODEL 251



Item #2510

Item #182, Onan Power Unit PE-95C is an electric generating set consisting of a 4-cylinder, 4-cycle, L-head, liquid-cooled, electric starting gasoline engine, directly connected to an AC generator of the revolving field type. Uses Approx. 1.1 gal. of gas per hr. at rated load—generator is rated at 5 KW, 60 cycles, single phase, 115V, 52 Amps. F.O.B. Chicago **795.00**

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ITEM #59

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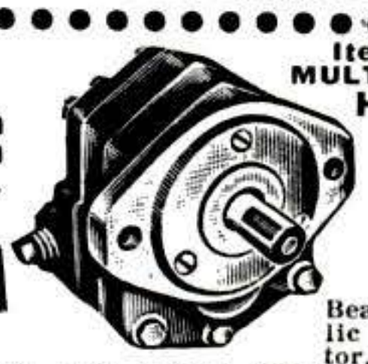

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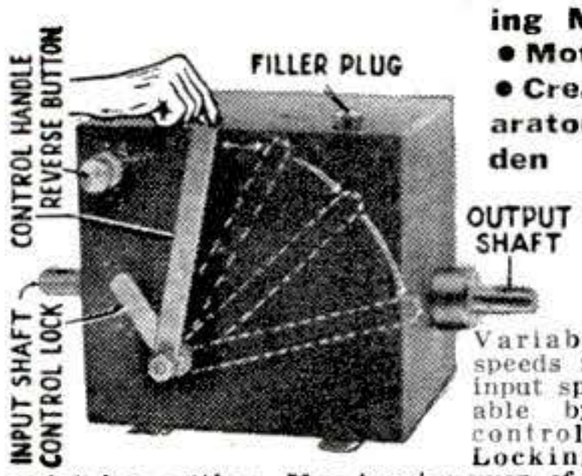

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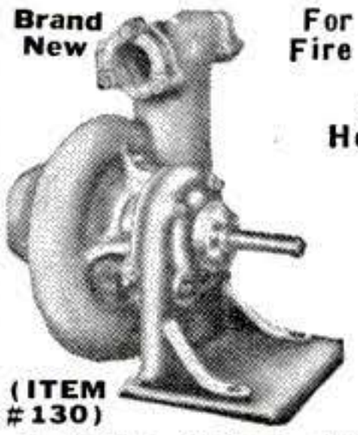

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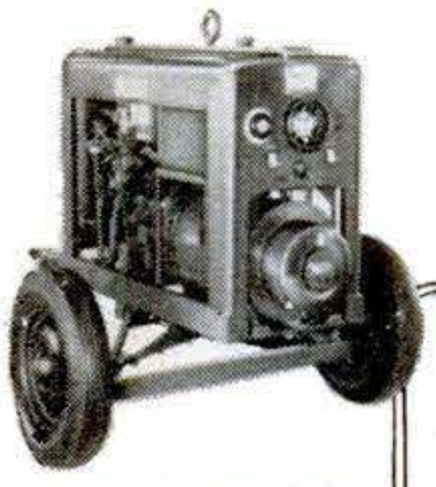

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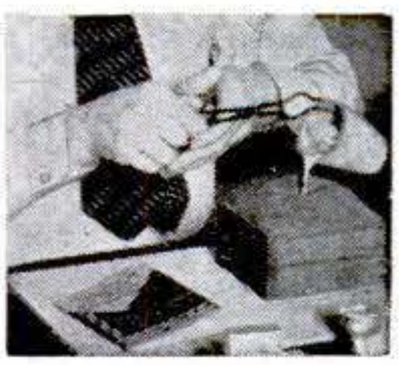

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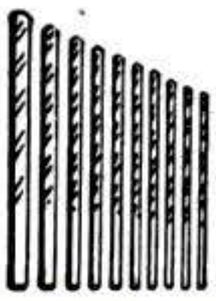

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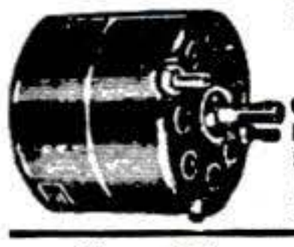

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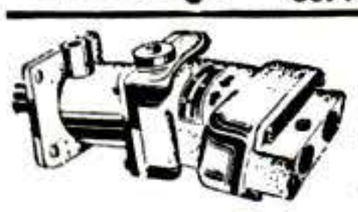

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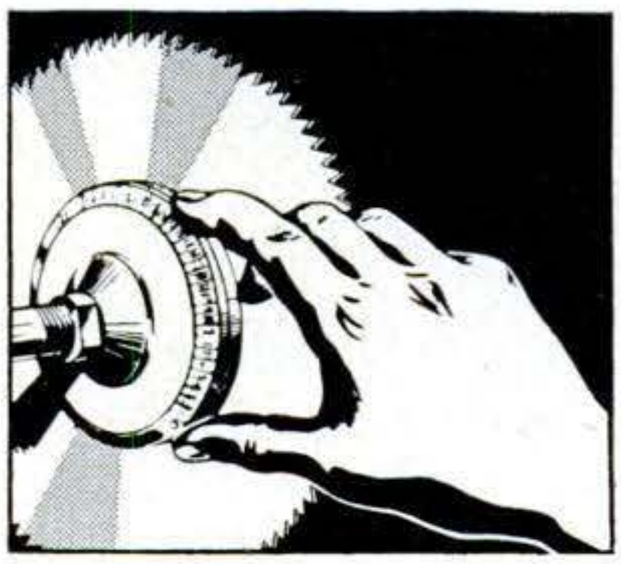

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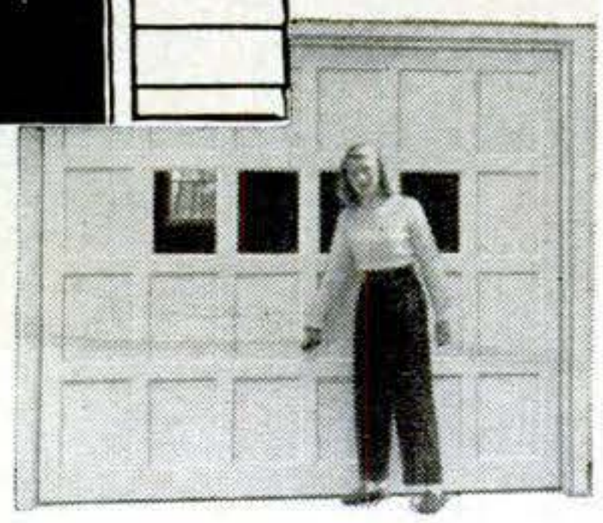

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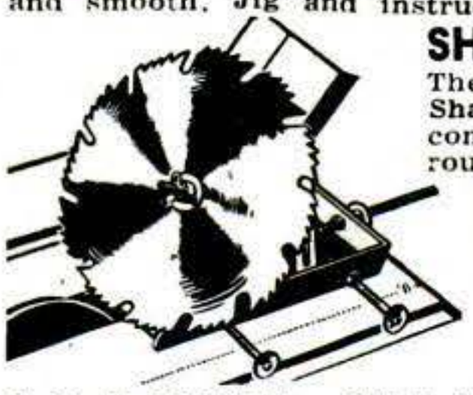

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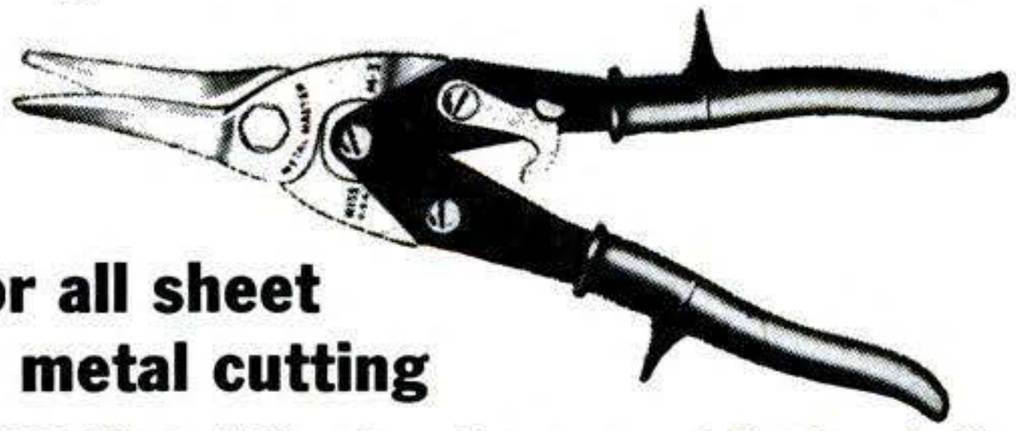

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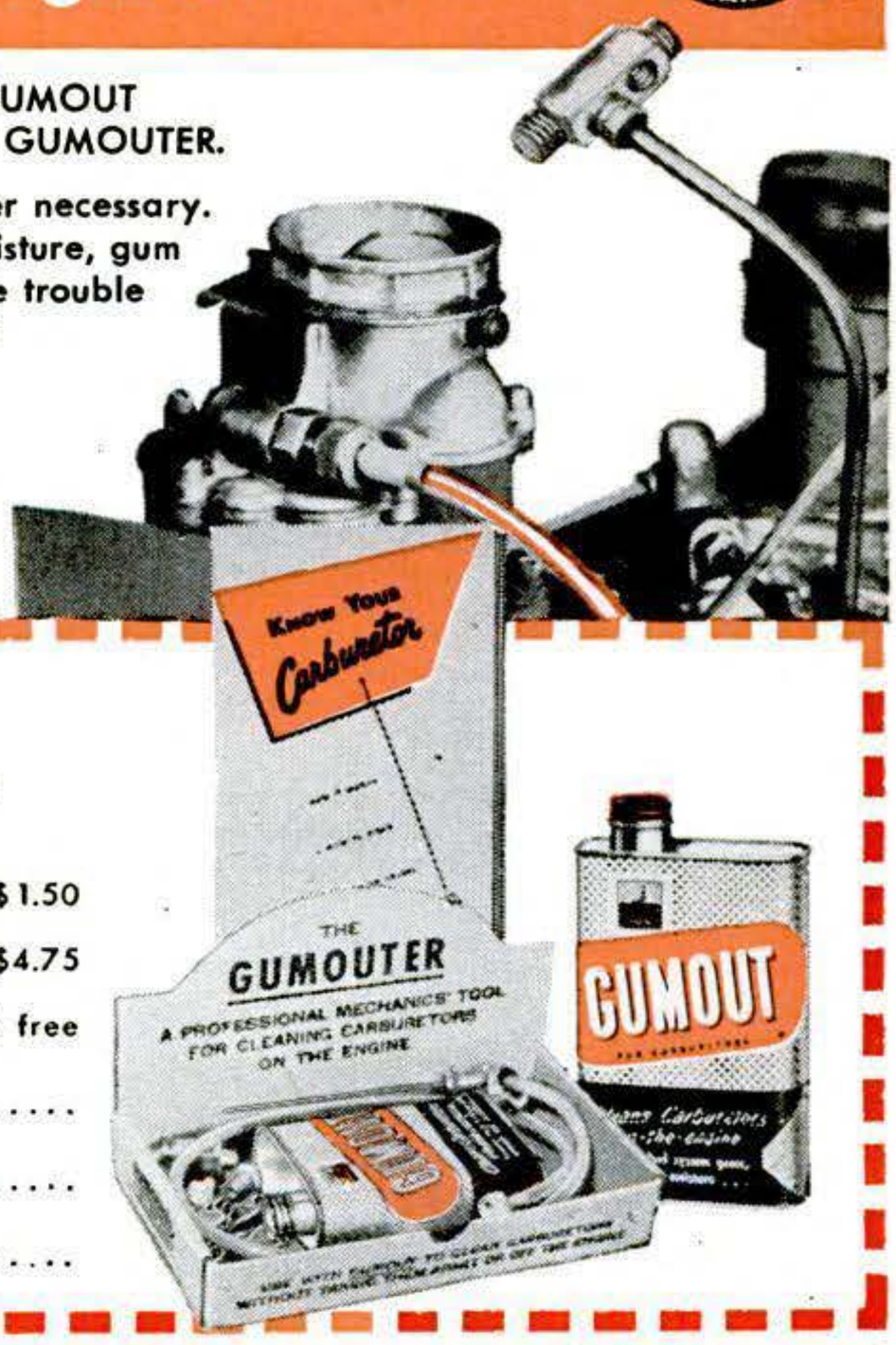

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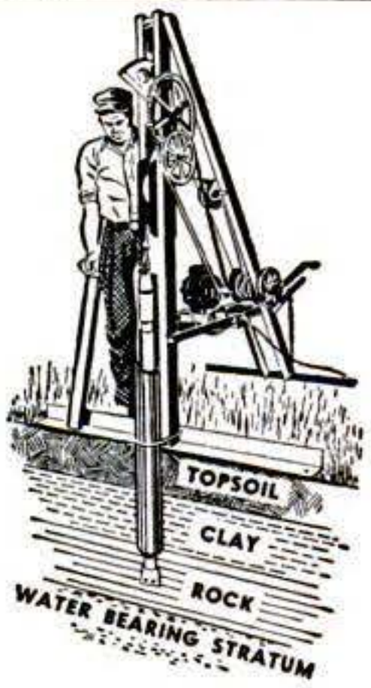

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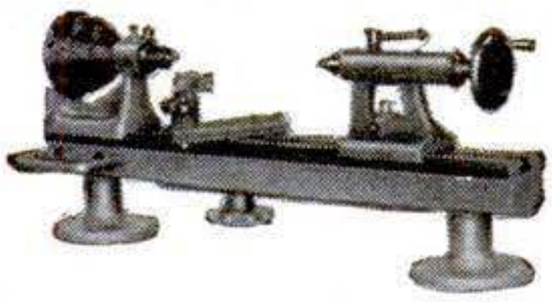

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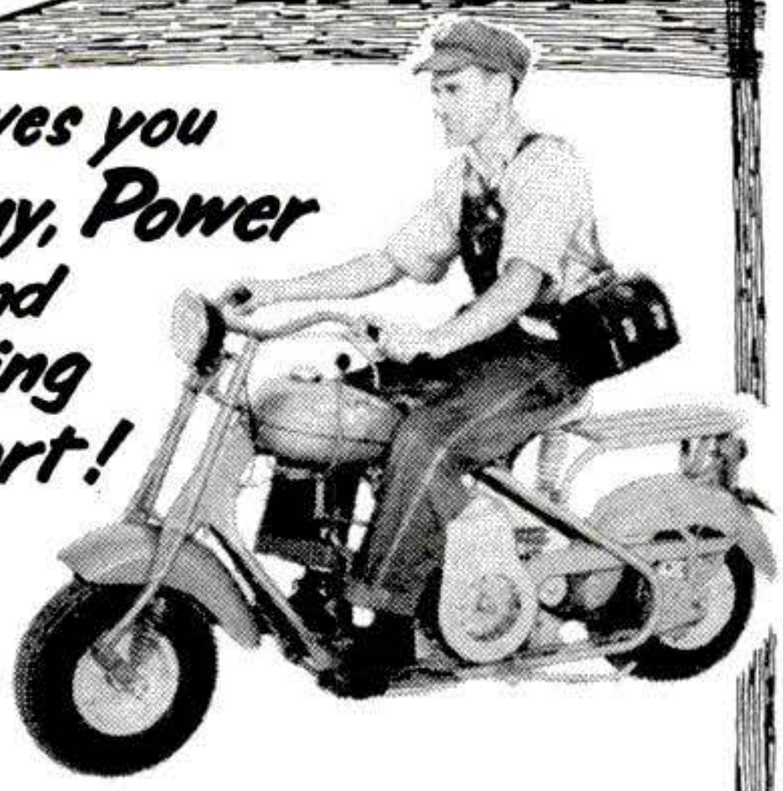

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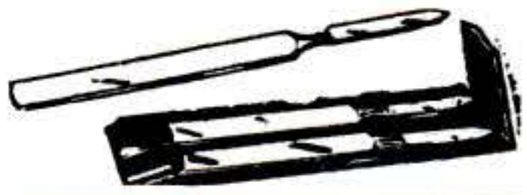

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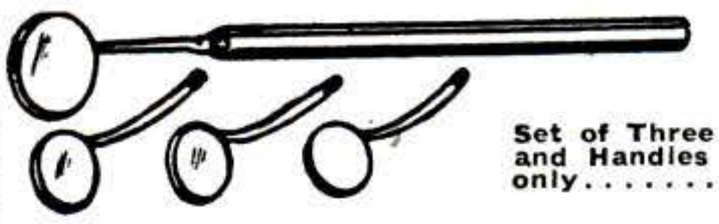

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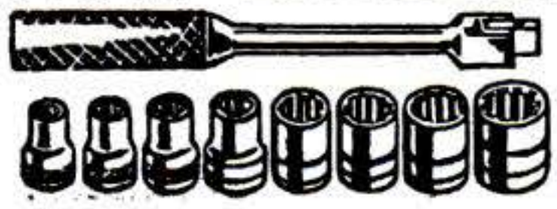

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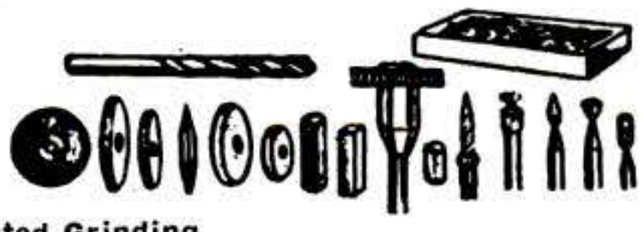

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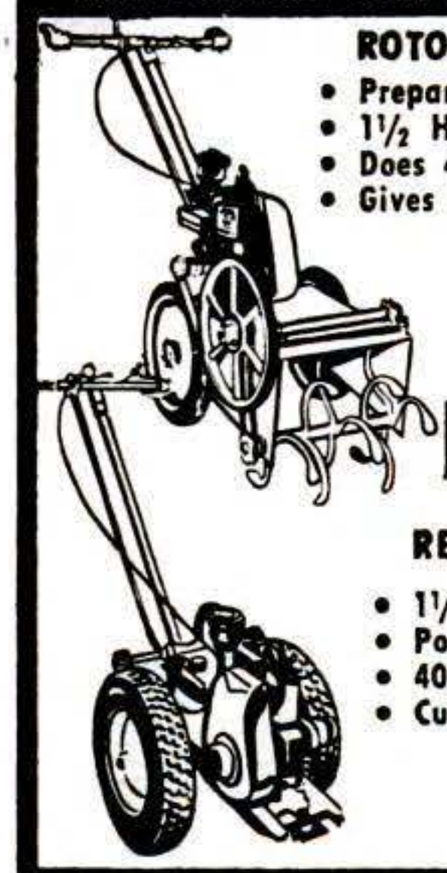

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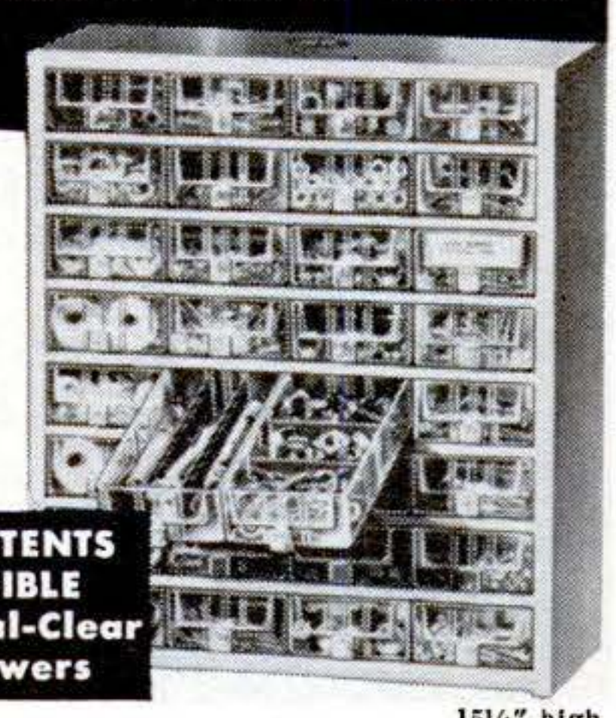

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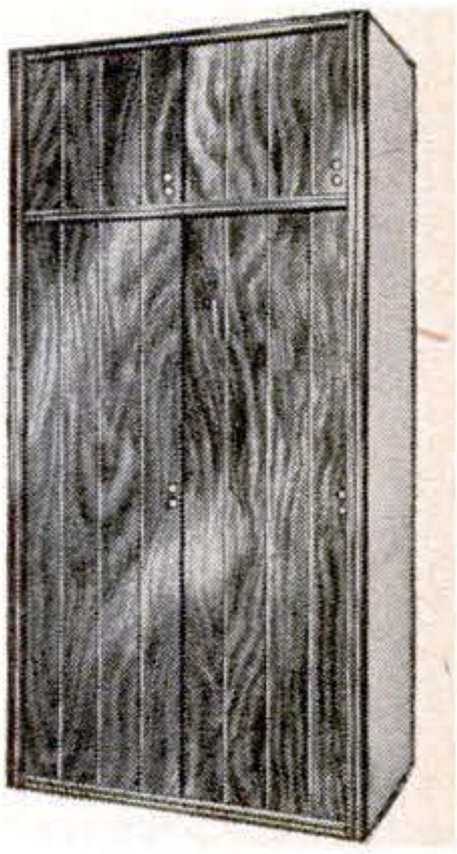

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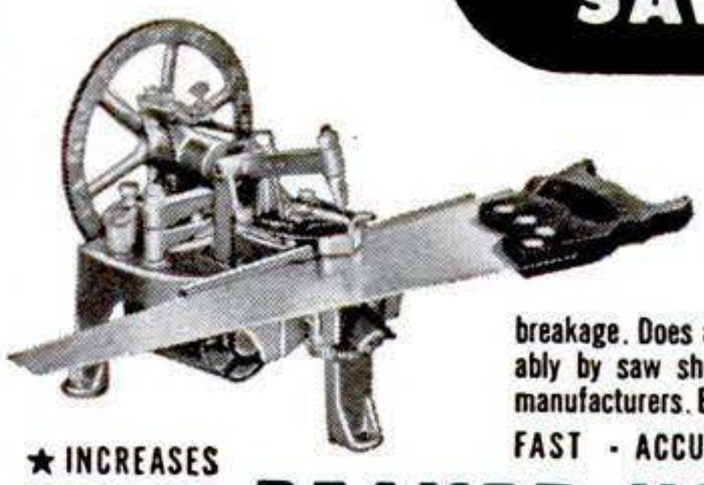

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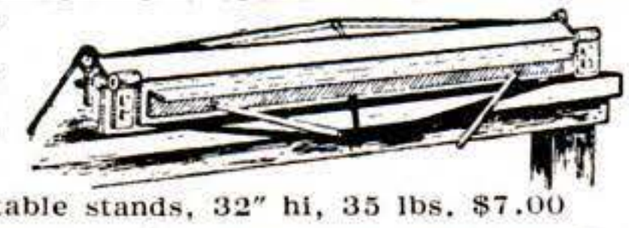

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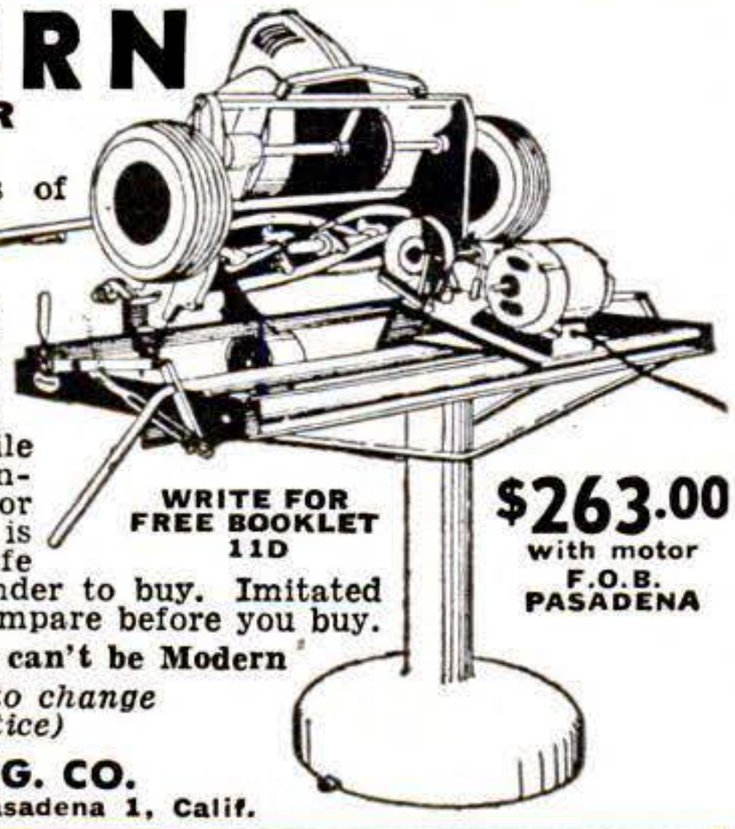

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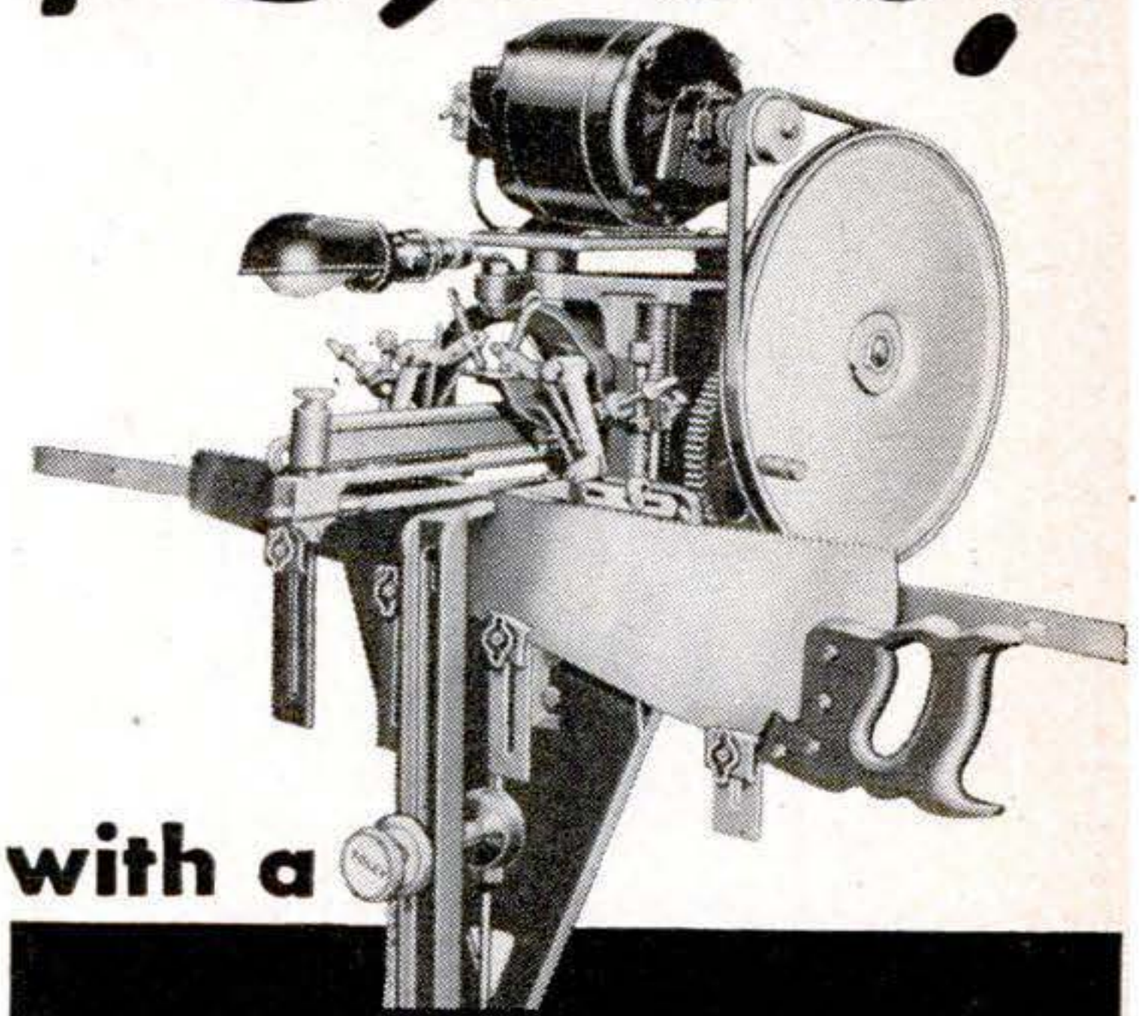

with a

FOLEY *automatic* SAW FILER

"Last year's profit amounted to $3.000. Not so bad for a one-man outfit"—from Chas. C. Hough. James B. Williams wrote us—"I made $765 last year filing saws, and it sure comes in handy. I do this work in my spare time." Men in communities of all sizes make up to $3 or $4 an hour with the Foley Saw Filer working full time or part time. That extra money comes in mighty handy in these days of high prices.

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REPLACEMENT BLADES: Specify 5" Safecut, or Combination, or Rip, or Crosscut Style..... **$1.75**

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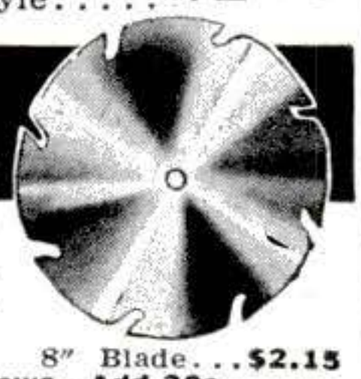

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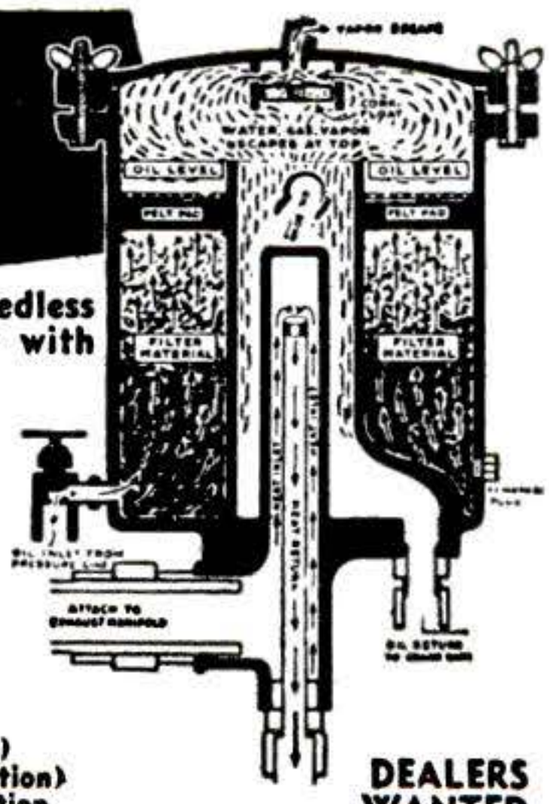

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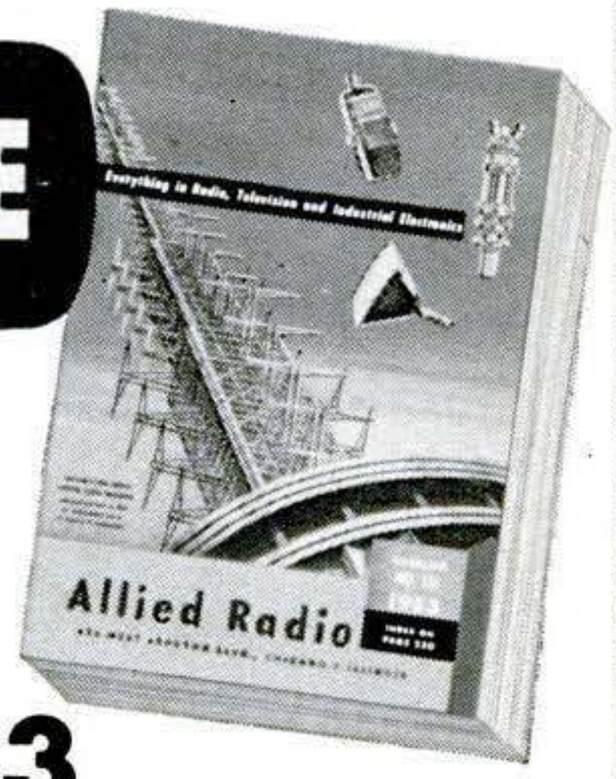

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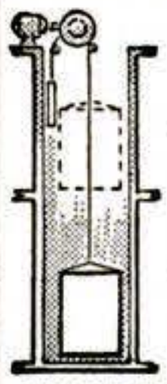

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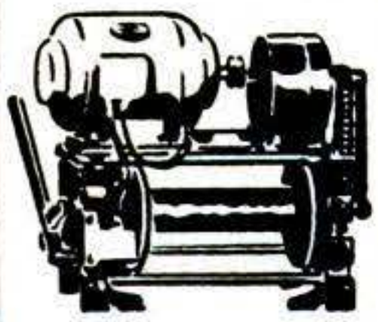

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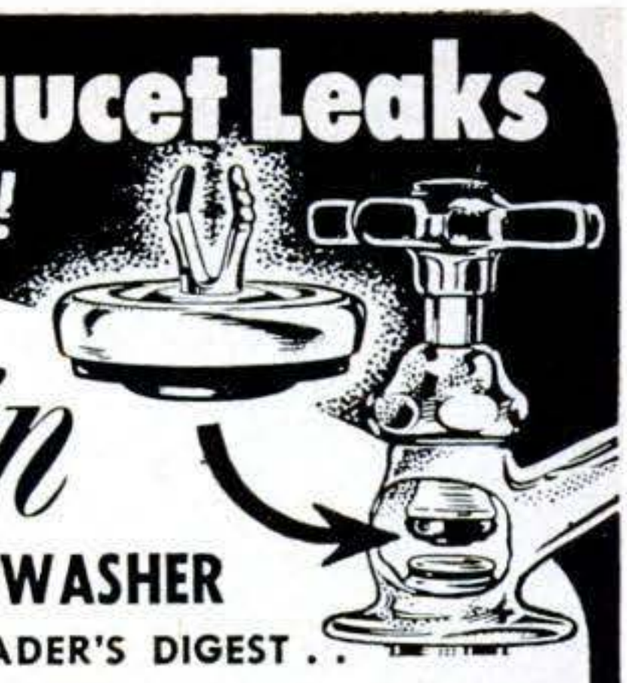

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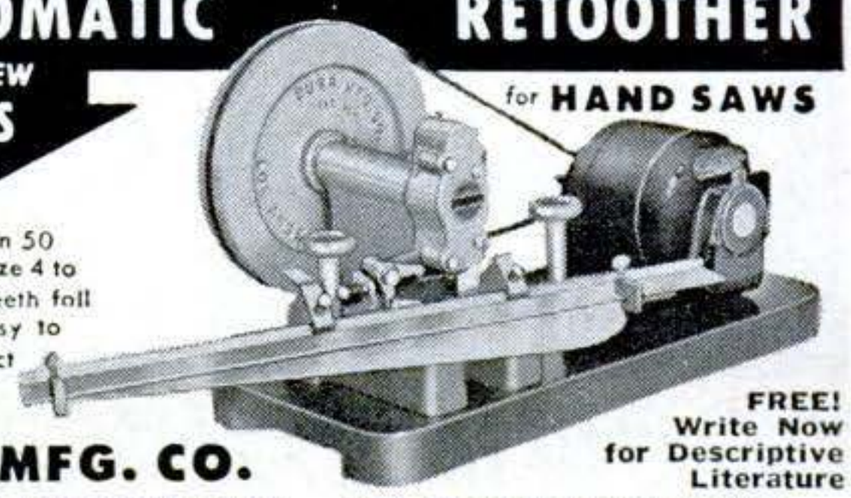

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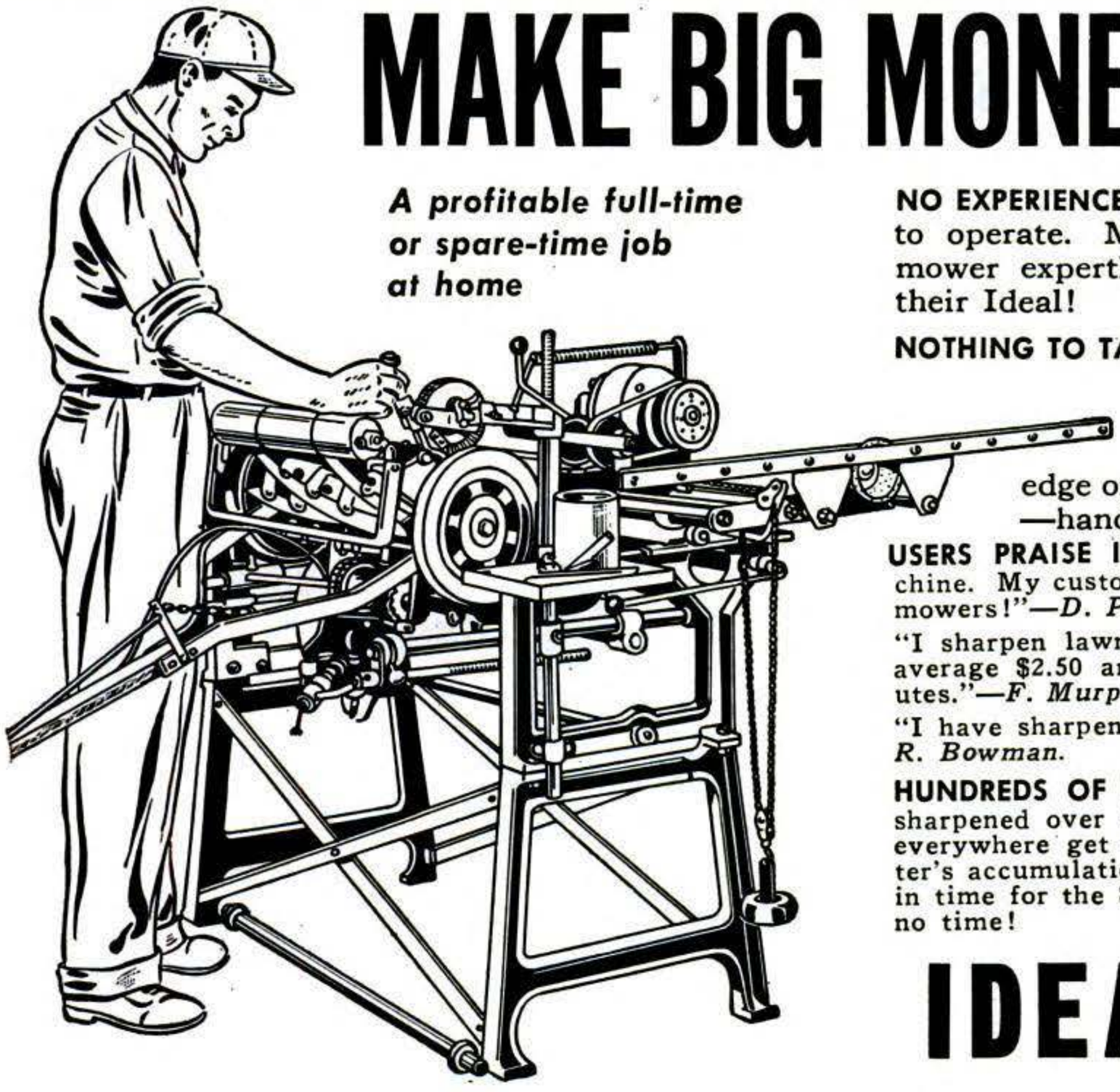

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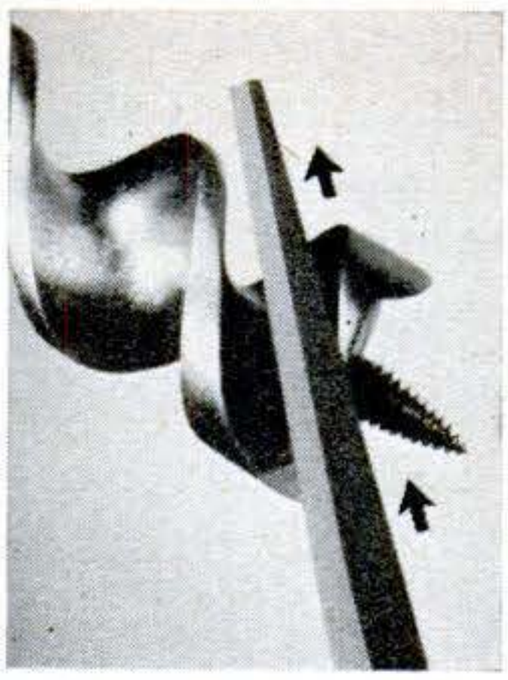

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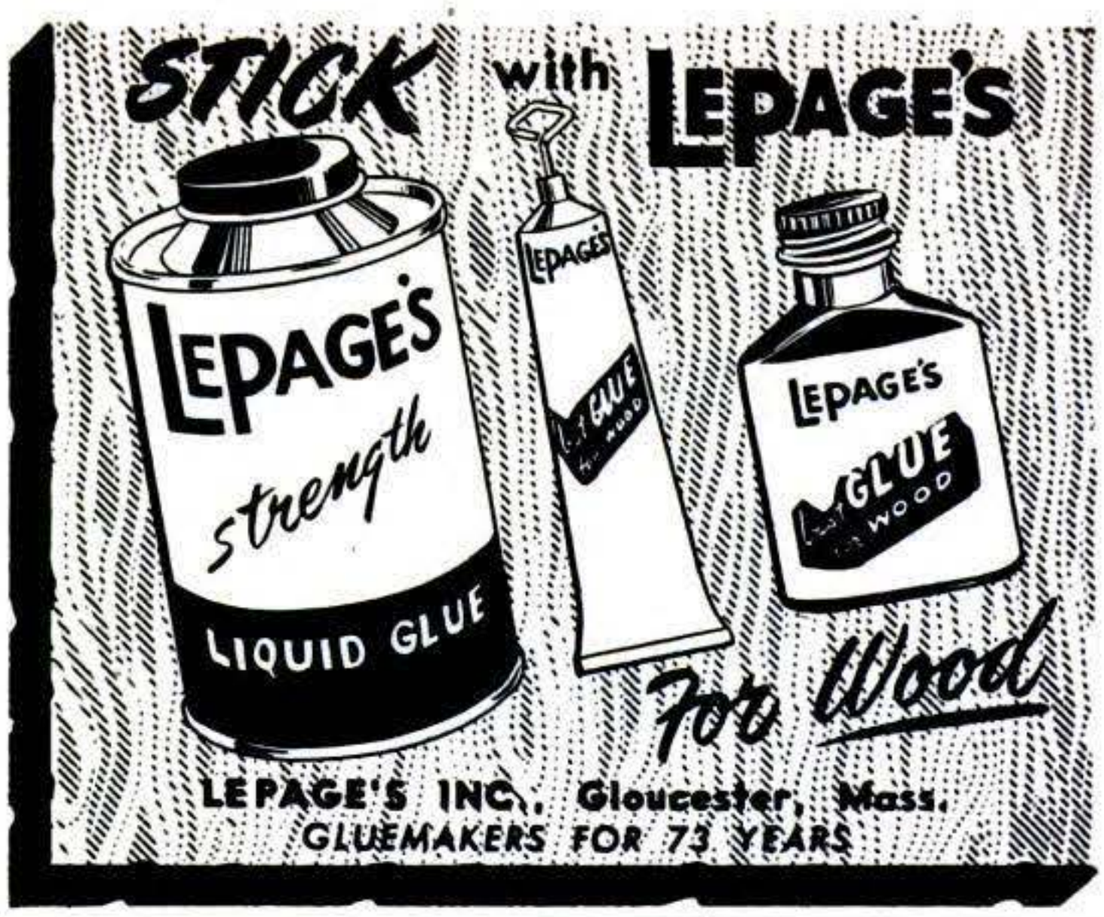

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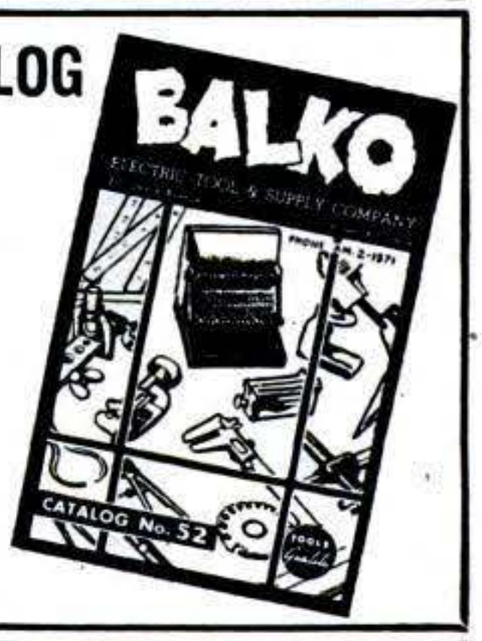

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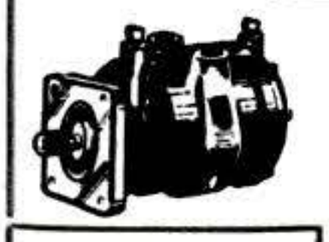

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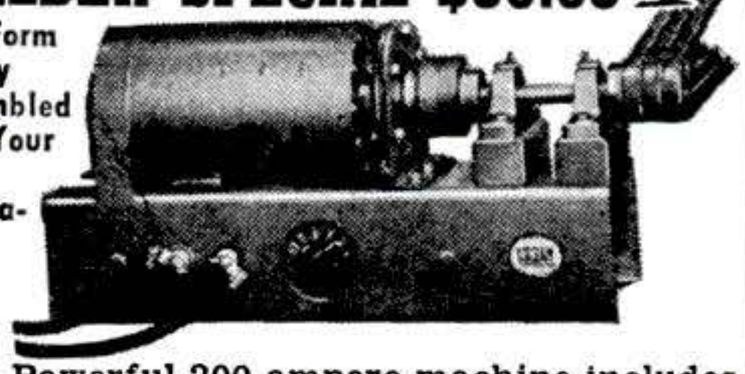

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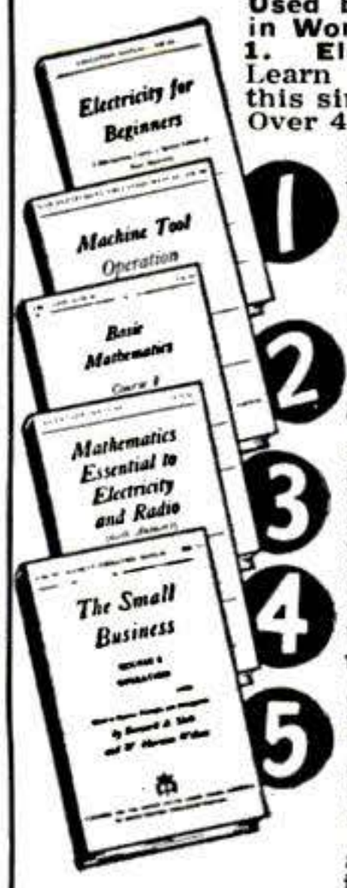

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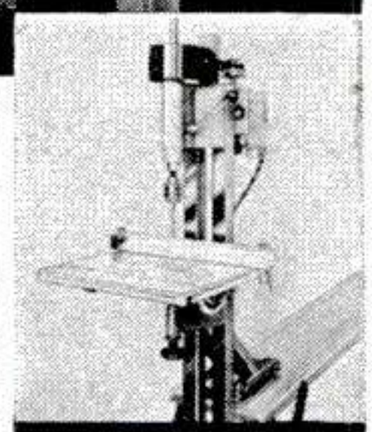

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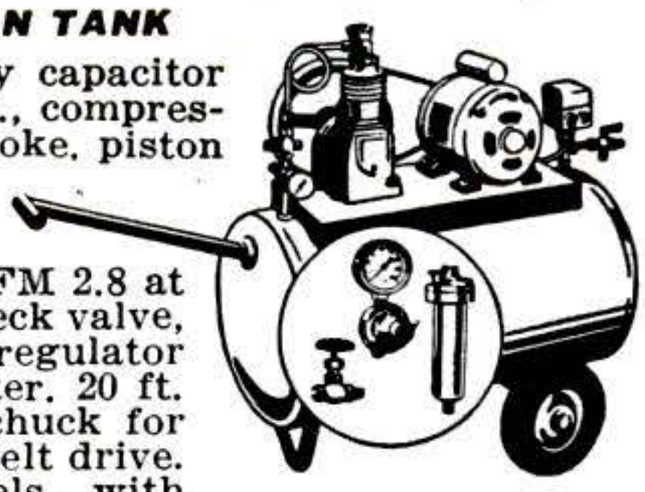

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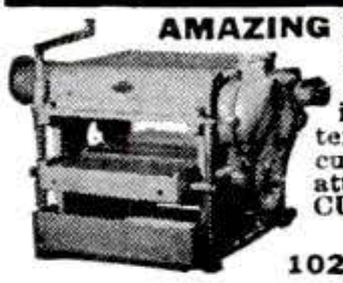

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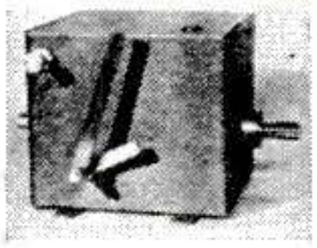

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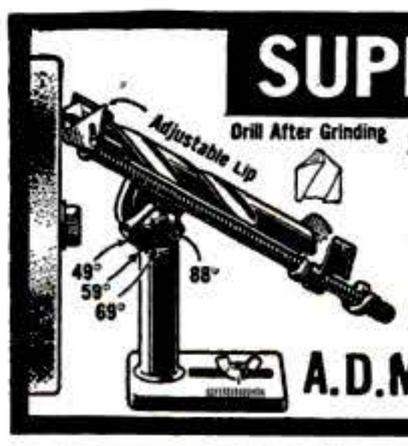

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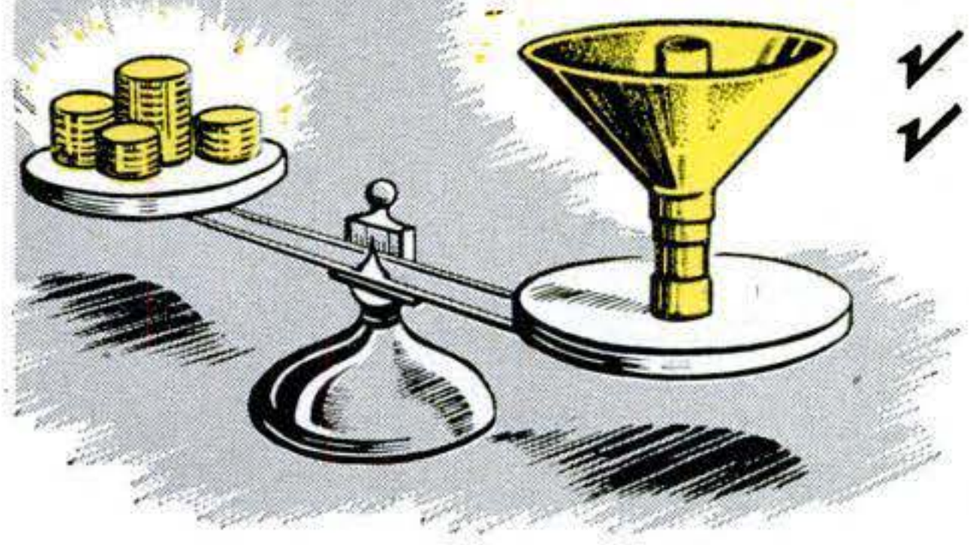

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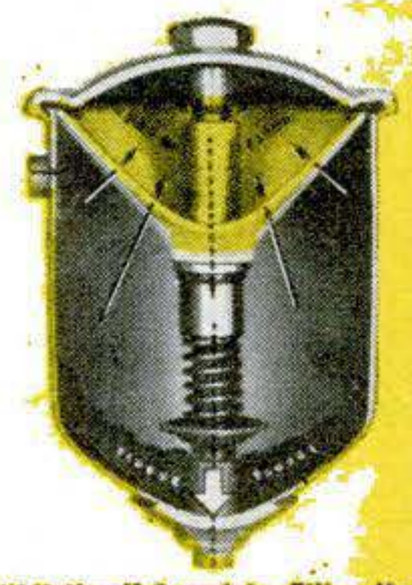

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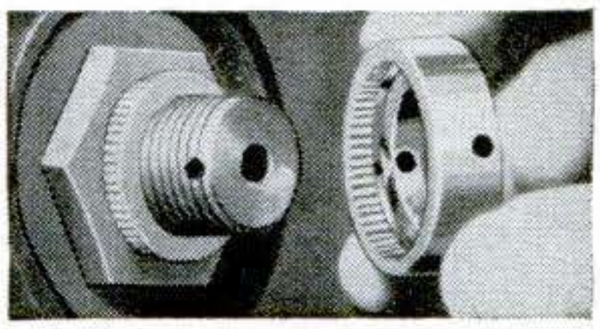

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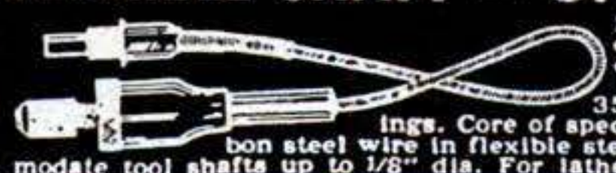

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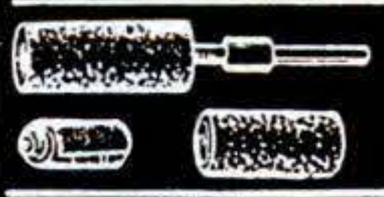

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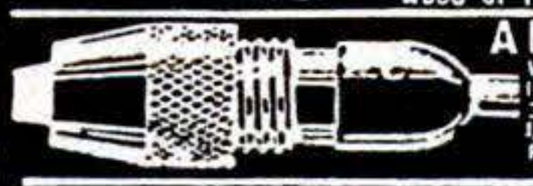

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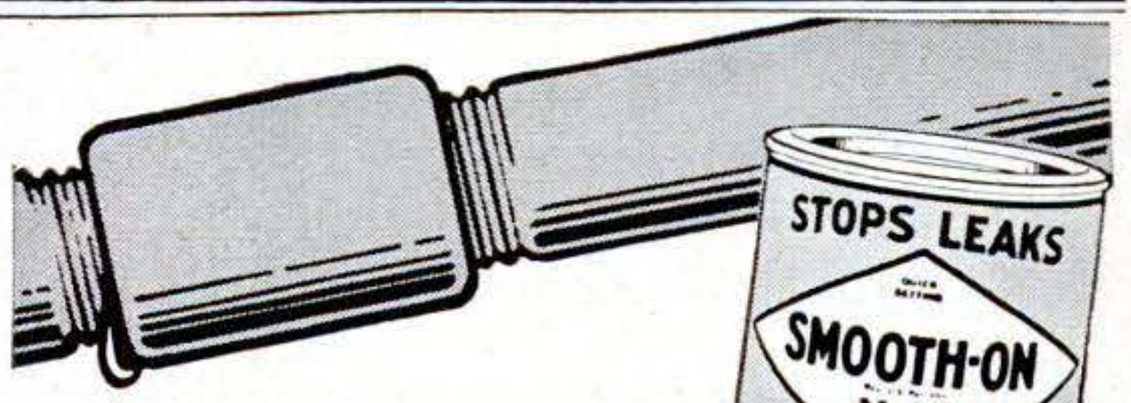

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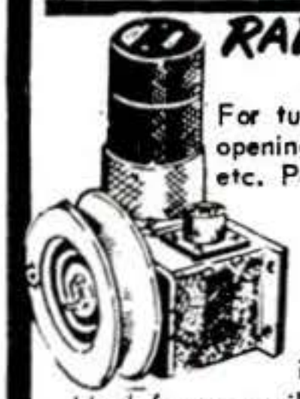
SAVE UP TO 85% ON WAR SURPLUS
FROM WORLD FAMOUS 'GADGETEER'S' HEAVEN

RADIO BARGAINS

RADIO MIX

Ideal for 'ham' operators, experimenting, etc. Mix contains: Headset, mike, button, trans. wire, insulators, switches, condensors, rheostats, terminals, jump cable, etc. 8 packed lbs. **2.49**

RADIO ANTENNA REEL



For tuning beam antenna, opening and closing doors, etc. Powered by 1/8 HP, 24V, GE motor, engaged to a gear reduction only when electrical contact is made. Operates in either direction. Ideal for an auxiliary power take-off. Has 150 RPM at take-off.

NEW 8.75 USED 6.75

AIRCRAFT CABLE

Rust resistant, alloyed steel. Extra flexible. Pre-formed, 7 x 19 strand. On reels

1/16"	4½¢ ft. (7x7)	7/32"	11½¢ ft.
5/64"	5¢ ft. (6x7)	1/4"	12½¢ ft.
3/32"	5½¢ ft. (7x7)	9/32"	15¢ ft.
1/8"	7½¢ ft. 7x19	5/16"	16½¢ ft.
5/32"	8½¢ ft. "	3/8"	18¢ ft.
3/16"	10½¢ ft. "	1/2"	20¢ ft.

Stainless Steel Cable – Pre-Formed

1/16"	7¢ ft.	5/32"	20¢ ft.
1/8"	18¢ ft.	3/16"	23¢ ft.

Bronze Cable – Not Pre-Formed

1/16"	5¢ ft.	5/16"	23¢ ft.
1/4"	17¢ ft.	1/2"	38¢ ft.

CABLE ASSEMBLIES

Originally made for aircraft controls. Equipped with integral fittings at both ends. Rust-proof. 7 x 19 strand.

1/16" x 28 ft. with turnbuckle ends Two lengths for Only . . . **1.59**

3/16" x 8 ft. with threaded stud at one end & eyelet on other. 3 lgths. . **1.59**

3/16" x 18 ft. with turnbuckle ends. Two lengths for Only . . . **1.89**

3/32" x 49 ft. Made of 2 lgths. of 17 ft., with turnbuckle ends, and 2 lgths. of 3 ft. with 1 turnbuckle and 1 clevis end. One complete length Only **1.98**

NYLON ROPE

5/8" diameter. 16 strand. Easy to handle. Extra strong. Long lasting. A bargain at . . . . **21¢ PER FT.**

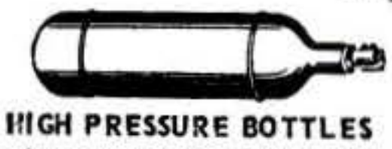
NYLON SHROUD LINE (Parachute) Approx. 1/8" in dia. TEN – 15 ft lengths. **2.95**

PRESSURE TANKS

G-1 Type – Stainless Steel, shatterproof & rustless. Has reinforcing ribs and is pressure tested up to 400 PSI, Has high safety factor Both ends have 1/4" pipe ports.

Ideal for use as a buoy, drinking water supply, underwater fishing, diving, painting, cooking, or spraying.

G-1 – 12½" x 24" ONLY **10.95**
D-2 Tank- 500 cu. in cap. . . **3.95**
A-4 Tank- 104 cu. in. cap. . . **1.95**



HIGH PRESSURE BOTTLES

Tested to capacities of 3000 PSI. Ideal spraying, welding, inflating, etc. For use with AIR or GAS.

H-1A – 2-7/16" dia., 10" long. **2.29**
H-5 – 3-1/4" dia., 19" long. **3.95**
H-7 – 5" diameter, 19" long. **7.95**

TREMENDOUS SAVINGS ON PALLEY HYDRAULICS

Here at Palley's we carry the WORLD'S LARGEST supply of special Hydraulic Equipment. Our huge stocks of Hydraulic Cylinders alone feature over 20,000 units in 61 sizes and types. We also stock thousands of accessories such as Hydraulic Pumps, Transmissions, Valves, Tanks, Fittings, Hose, etc.

HYDRAULIC CYLINDERS

No. 3 – Double Action Cylinder Bore is 1", Shaft 1/2", Stroke adjusts from 2-1/2" to 4" with internal sleeve stops. Length overall 8-1/2". Will take 1500 lbs. continuous – 3000 lbs. intermittent. Will lift or push 1100 lbs. . . **5.75**

No. 42 – Double Action Cylinder. Bore is 3-1/4", Shaft 1-1/8", Stroke 9-1/8". Length 17-1/2". Lift capacity with 1500 PSI line pressure approx. 12441 lbs. **18.75**

NO. 4 – Double Action Cylinder. Bore 3", Shaft 1-1/8", Stroke 3-1/2", Length 8¼". Lift capacity with 1500 PSI line pressure 10500 lbs. **18.75**

No. 53 – Double Action Cylinder. Bore is 2-3/8", shaft 1¼", stroke 15½, length 26". Gives 6645 lbs. lift with 1500 lbs. line pressure. **20.50**

NO. 29 – Double Action Cylinder Special Gives 20,000 lbs. lift with 1500 PSI line pressure, or will give 40,000 lbs. thrust on intermittent 3000 lb. line pressure. Has 4" bore, 1-1/2" dia. piston shaft. 18" stroke, 30-1/2" length. Ideal for presses, road, farm and shop equipment. Cost Gov't $390. **29.95**

P-1A Pesco Gear Type Pump Capacity, 1¼ GPM at 1500 RPM at 1500 PSI. Pressure limit is 1500 PSI continuous, with intermittent maximum of 1875 PSI for 15 seconds. Normal operating speed is 3750 RPM with an intermittent maximum speed of 4500 RPM. Rotates right-hand only. **Now 8.95**

V-15 – 4-Way Control Valve Poppet type. Pressure balanced. Positive shut-off at neutral position. Has dual control handles. An ideal valve for use with single or double acting hydraulic cylinders or in a multi-service system. Can be used in combination with other valves to produce accurate, selective control system. Ports are 3/8" AC tube size (9/16"-20 thread). **6.75**

No. V-4AB MANUAL CHECK VALVE Cam Piston type. Permits free flow in one direction while checking any 'back flow' until control handle has been positioned to allow free flow in both directions. Has 1/4", tube size ports (7/16"-20 thread) **2.25**

Send 25¢ Today for Illustrated Catalog of thousands more Hydraulic Bargains.

BENDIX HYDRAULIC PUMP AND MOTOR 13.95

Has 3½ GPM capacity at 600 PSI. Motor is 1½ HP, 24V, DC. Operates on either 12 or 32V, DC current. Has built-in relief valve adjustable to 1500 PSI. This unit ideal for bait tanks, hyd. lifts, portable loaders, etc. Cost Gov't approximately $350.00.

VICKERS HYDRAULIC TRANSMISSION

Self contained, 2 H.P., constant torque at all speeds with variable volume reversible, piston pump (controlled by outside lever) supplying piston hydraulic motor. Automatic pressure, dash pot for smooth control. Power output RPM –0 to 1/3 input RPM in both directions. Input RPM 1800 continuous. 4000 intermittent. Dash pot can be removed for greater RPM. Ideal for lathes, duplicator set-up of mills, conveyors, small cars, drives, gearings, etc. **40.00**

4" SPLINE SHAFTS for input & power take-off . . **2.50 PR**

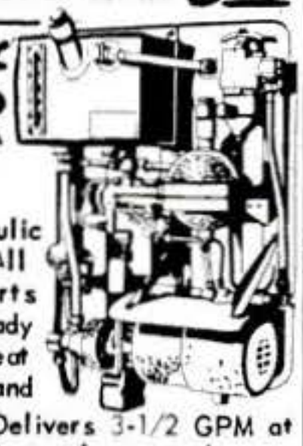
Pulley Adapters – Bearing Block. Set $20.00

CUNO OIL FILTER

An aircraft type oil filter which can easily be adapted to autos, etc. Will keep oil clean without a cartridge replacement. Can be installed in minutes. Has two mounting braces. Lge Size, 3/8" std pipe ports

A real SURPLUS BARGAIN. **6.95**

HYDRAULIC POWER UNIT



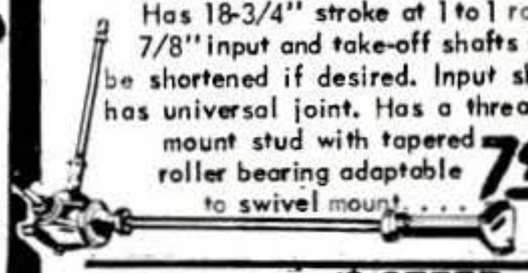
Complete hydraulic pumping unit. All necessary parts assembled & ready to work at a great saving in time and cost to you. Delivers 3-1/2 GPM at 1500 PSI. (other volumes and pressures can be attained by simple adaptations) Unit consists of a gear pump driven by a 2¼HP, DC motor (4000 rpm max.), relief valve, pressure unloading switch, filter, accumulator, reservoir with sight guage & complete plumbing. Mounted on 19"x 25" aluminum panel. Complete with 24V-DC motor. (Other motors of any current can be adapted) **49.95**

230 PAGE CATALOG

1000's of ITEMS! Fully ILLUSTRATED! For the MECHANIC, SPORTSMAN, HOBBYIST, HOME OWNER, etc.

War Surplus — Factory Closeouts and General Merchandise Values! Save on Hardware, Hand & Power Tools, Gadgets, Sports Equipment, Hydraulics, etc SEND 25c for HANDLING & MAILING.

RIGHT ANGLE SPINDLE DRIVE or GEAR BOX

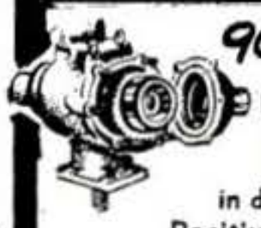


Has 18-3/4" stroke at 1 to 1 ratio. 7/8" input and take-off shafts may be shortened if desired. Input shaft has universal joint. Has a threaded mount stud with tapered roller bearing adaptable to swivel mount. . . . **7.95**

3 SPEED TRANSMISSION

Converts a high speed, low power input into low speed, high power take-off. Has 2 take-off shafts at 4 to 1 and 16 to 1 ratios. Gear box has a worm drive, bronze gears and a throw-out clutch. Will operate in either forward or reverse directions. Adaptable to many uses on power machinery. . . . **19.95**

90° TRANSMISSION



Has 1½ to 1 gear reduction through bevel gears. Pre-lubricated bearings in dust proof housing. – A Positive lever control clutch . . Size: 7" x 6". – 3/4" take-off shaft **3.95**

ELECTRIC ACTUATOR

NEW

Foote Linear **Actuator** – Has hundreds of uses for any mechanical device needing controlled two way action. Will open, close, raise or lower doors, windows, gates, etc. Has 8500 RPM, 1/6 HP series wound motor. Operates on 24 V, DC current. Gives 4-1/2" stroke in 13½ secs. Compression and tension loads up to 750 lbs. Has adjustable micro switch for limits of travel. The lgth. retracted is 11 inches. . . **7.95**

GEAR HEAD MOTORS

Heavy duty, G.E. motor. 2 HP, 24V, DC, 125 amp., reversible motor to drive a reduction gear unit giving 36 to 1 ratio at take-off. Unit will operate on 6 or 12 volts

36 to 1 G.E. (306 shaft RPM)
28 to 1 Eclipse (130 shaft RPM)
40 to 1 Eclipse (110 shaft RPM)
10.95 EACH

GHM-528 Lear GEAR HEAD MOTOR – Lear 24 volt DC. 7.6 amp, series wound reversible motor with overload clutch. Motor turns 11,000 RPM driving thru a 10 to 1 gear reduction box which turns the final take-off shaft 1000 RPM. Adjustable limit switches control limit of travel. Take-off shaft adapts to flex or rigid drive. Size: 10"x4". **9.95**

MAGNETIC BASE INDICATOR HOLDER

Time saver for precision checking. Magnetic base fits curved or flat surface. Has 45–50 lb. pull. 6½" stainless steel rod which is mounted in ball socket to permit universal settings. **3.50**

NOTE: We have complete line of instruments, depth gauges, inspection mirrors, etc. Write Today!

MAKE YOUR OWN POWER UNIT

COMPLETE UNIT

MOTOR **3.25**

GEAR BOX NEW **12.95** USED **6.75**

Here's a unit PACKED WITH BRUTE FORCE! Does all those hard, heavy jobs that ordinary Power Tools cannot handle. Easily made from a vacuum cleaner type motor, a gear reduction drive and a few homemade parts. Can be used for turning large nuts & bolts, digging post holes, drilling large holes in wood or metal, driving power tools, & machinery, lifting, pulling, pushing, or any job where a slow speed with high take-off is required. YOU CAN'T STALL IT! Lightweight, easy to handle. Has 1000's of uses in the home, garage, shop, factory. We supply complete instructions

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LOS ANGELES 58, CALIF.

Order From This Ad. Pay by M.O. or check. P.O's. accptd. from D&B firms ½deposit with C.O.D's. All Prices FOB Los Angeles.

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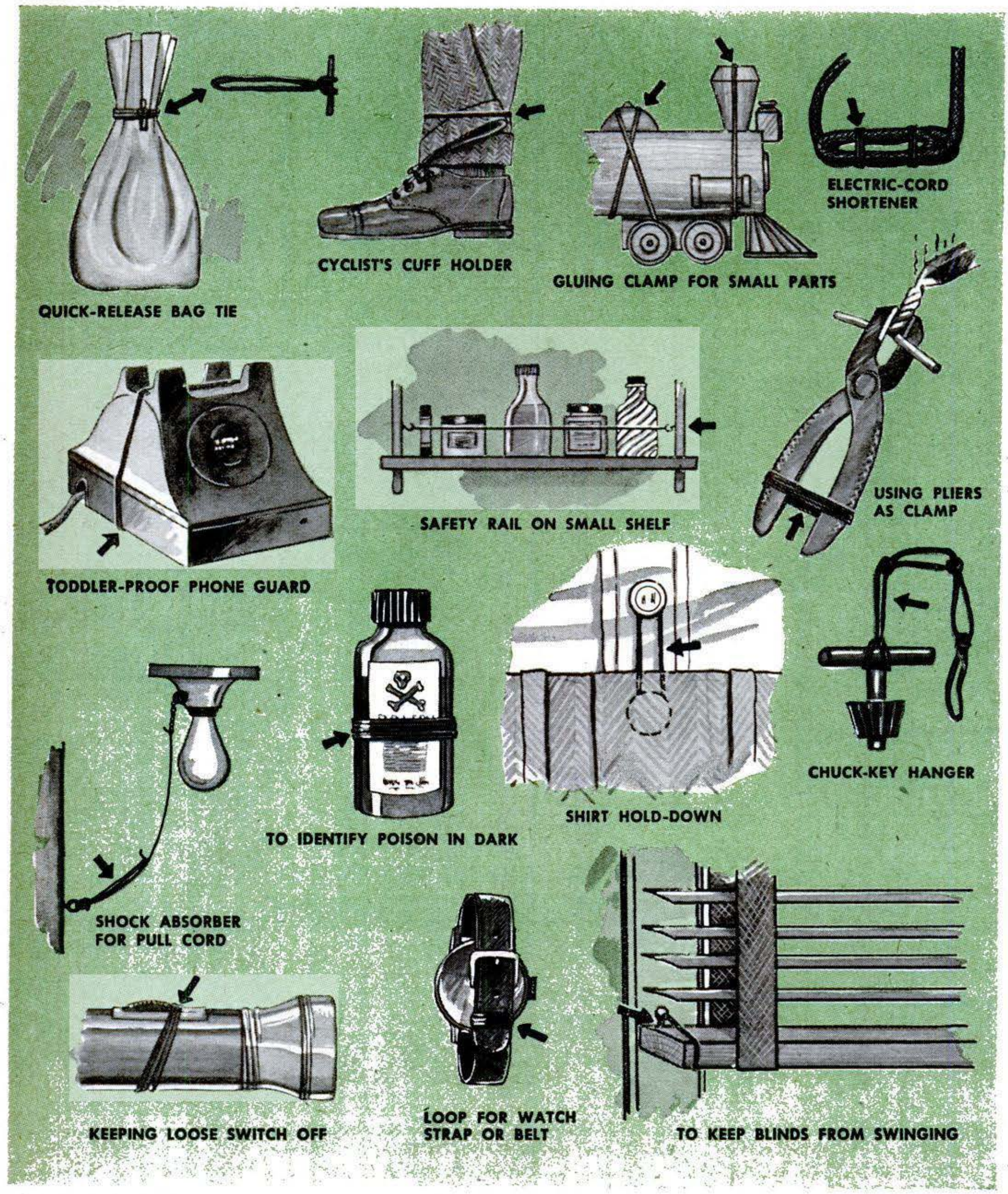
Let a Rubber Band Do It

They are handy for all kinds of chores from powering model gliders to identifying bottles of poison.

A LIVELY rubber band is very useful to a small boy. It flies model gliders, propels spitballs, and has been known to substitute for chewing gum. Young imaginations can keep those rubber bands on constant duty.

But so can you. The little finger snappers are handy for far more than holding cancelled checks together. For instance, they'll serve as light springs, or provide a quick nonslip hand grip. Below are 14 other chores rubber bands can handle with snap.—*C. B. Colby, Briarcliff Manor, N. Y.*



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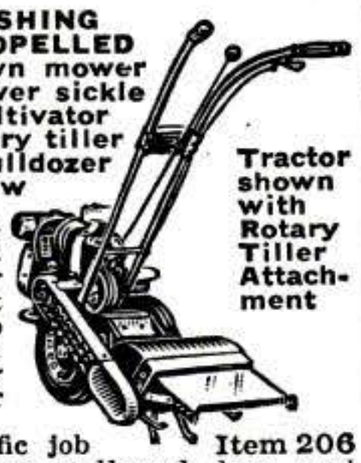
BUY DIRECT FROM FACTORY
AT TREMENDOUS SAVINGS

MASTER GARDENER

NO PUSHING
SELF-PROPELLED
It's a lawn mower
It's a power sickle
It's a cultivator
It's a rotary tiller
It's a bulldozer
It's a plow



Tractor shown with Rotary Tiller Attachment

Where else can you get a power tool that does so many jobs. Works for you year 'round. Does terrific job of preparing mellowed deep seed bed without labor. Built-in power take-off to drive pumps, saws, generators, etc. Safety clutch—can't burn out. More versatile and efficient than tractors costing twice as much. Converts in minutes to Lawn Mower, Power Sickle, etc. Basic self-propelled 2 hp tractor with Briggs or Clinton famous engine. Only **$119.50**

Item 206

Snow Blow $39.50
Rotary Tiller $42.50
Sickle Bar-Mower $42.50
Furrowing Tool .....$ 8.75
Bulldozer $11.25
Lawn Mower Hitch .....$ 4.50
Cultivator .....$ 8.75
Disc Harrow $15.75
Freight prepaid to most areas. Easy payment plan available.

VENTILATING FAN

(Item 10) Mount in wall or ceiling to ventilate any area. Over range, removes kitchen smoke and odors. Easily installed in furnace pipes. Forces even heat to all rooms. Powerful continuous duty motor, 110-120 v. A.C. Quiet, super efficient fan moves huge volume of air (400 to 600 c.f.m.) 8" Fan, wt. 5 lbs., **$6.85**; 9" Fan, wt. 6 lbs., **$7.85**; 10" Fan, wt. 7 lbs., **$8.85**; 12" Fan, wt. 8 lbs., **$9.85**.
HEAVY DUTY 12" fan, enclosed motor, suitable for spray booths, restaurant exhausts, poultry houses, and other difficult applications. Wt. 10 lbs. Item 10D....**$12.95**

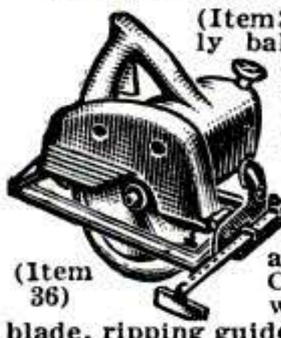
NEW MOTOR BIKE

Our Commando Motor Bike is trouble-free—carries amazing 5 yr. guarantee. Goes to 150 miles per gal. on all roads. Speed to 40 mph. No oil or gas fumes. Easy automatic pedal or pull starting. Has new principal of automatic transmission. No belts or chains—power transmitted directly to rear wheel. Accelerates quickly. Get free folder. Factory priced from..... **$199.50**
Buy complete unit—or motor only to attach to your own bike.

FIRE EXTINGUISHER

(Item 39) Fully charged (at 1,000 lbs. P.S.I. or more) with CO2 (carbon dioxide), the proven miracle fire fighting chemical that smothers oil, gasoline and electrical fires. Play safe; keep one in your car, garage and home. Heavy ICC approved steel cylinder, valve and 3000 lb. gauge that shows available remaining pressure. REFILLABLE at nominal cost. Hose included for emergency tire inflator or air blast. Wt. 4 lbs. $19.50 value. Special..... **$6.95**

ELECTRIC HAND SAW

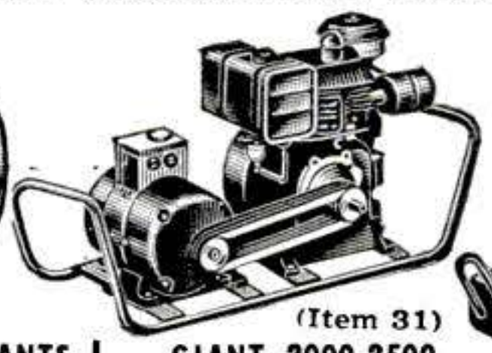


(Item 36)

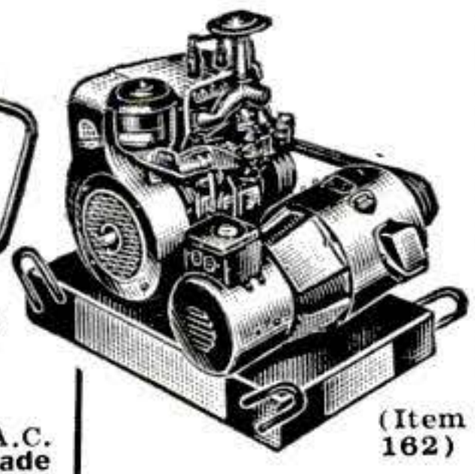
(Item 36) Most perfectly balanced, smoothest running saw made. Advanced design – max. power, light weight. Easily adjusted for all angles, depth and width of cut. Comes complete with 6¼" comb. blade, ripping guide and 10 ft. hvy. duty cord. Build-in sawdust blower. Autom. telescoping guard. 110-120 v. AC-DC. Depth of cut 2¼". 1 year written guar. Wt. 12 lbs..... **$39.95**

FINEST GUARANTEED LIGHT PLANTS

(Item 24)



(Item 31)



(Item 162)

PORTABLE LIGHT PLANTS

PUSH BUTTON START A.C. PLANT 500-700 watts—115 v.—60 cyc. A.C. Powered by a rugged 2 hp. easy-starting Briggs gas engine. No wiring necessary, just plug in and operate. Plenty of current for any oil burner, freezer, brooder, emergency lights, etc. which require up to 700 watts. Ideal for Civil Defense, Fire Depts., trailers and camps. Complete with Voltmeter and built-in winding to charge 6 v. auto batteries. Item 24. Wt. 85 lbs. Fully Guaranteed. *Be prepared if war or storm knocks out power lines.* Reg. $275 value. **$143.50**

700-800 Watt Plant (Item 44) same as Item 24 but larger engine..... **$169.95**

1000-1200 Watt Plant (Item 45) same as item 24 but larger generator & engine **$199.50**

350 watts—115 v. D.C. powered by a sturdy, easy-starting 1½ hp. Briggs engine, perfect for lights, radios, cabins, trailers, etc. Built-in control box with receptacle—just plug in. Wt. 65 lbs. Item 273. Reg. $199.50 value..... **$99.75**

GIANT 2000-2500 WATT PLANT

110-120 V. 60 cyc. A.C. **Absolutely the best made** – exclusive dynamically balanced armature: heavy windings develop up to 5000 watt overload for motor starting. Skid-mounted—portable. Powered by easy starting Briggs or 6 hp. Wisconsin engine – complete with all accessories; engine easily disconnected for other uses. Big outlet box, voltmeter, no wiring necessary. Ample current for all purposes. Factory warranty and complete instructions included. Wt. 220 lbs. Reg. price $585.00. Special at..... **$299.50**

With Electric Self Starter **$359.50**

Generator Only and control box. Drive it with your engine or tractor **$169.50.**

3000-3500 WATT PLANT (Item 198) 110-220 v. 60 cyc. A.C. with Wis. Engine. **Push button start.** Wt. 370 lbs. Heavy duty **$399.50**

Generator only for belt drive, Wt. 115 lbs. (Item 198A) **$239.50**

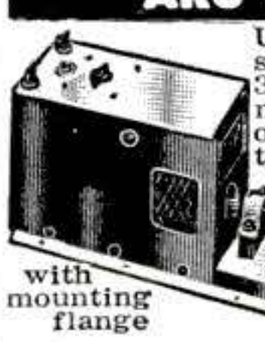
HI-LINE 6000 WATT PLANT

(Item 162) **Push Button Start,** 115-230 v. 60 cycle A.C. A brute of a power plant with a rugged 13 hp. Wisconsin engine. Plenty of electricity for ranges, water heaters, freezers, pumps, machinery, etc. Affords both 110 and 220 volts. Ideal where heavy current is needed. Wt. 590 lbs. Easily worth $995.00. **With self starter.** Factory price..... **$645.00**

Generator and control box only, belt driven. Use your own engine or tractor. Wt. 240 lbs. (Item 163) Factory price **$345.00**

We make fully automatic controls to operate any of above light plants. Write for details.

HEAVY DUTY D-C ARC WELDER



with mounting flange

Use as portable or shop welder. Up to 300 amps. Senior model. Made for years of trouble-free, continuous service. Will handle light or heavy jobs. Easily welds up to ¾" plate using ¼" rods. Built-in air cooling system. Arc is easy to strike and hold, because of specially designed arc stabilizer. Hi-lo switch and dial control gives wide range of welding heats. Run welder at 2600 rpm. with tractor, jeep or 15 hp. gas engine, or 7 hp. elec. motor. Complete with instructions, guar. and double V belt or flat pulley. You can pay more, but you can't buy a better welder. (Item 38) Wt. 110 lbs. $400 value at..... **$99.75**

DUAL CONTROL MODEL same as above but with built-in dual rheostat for low heat soldering, brazing, welding. Spec.. **$119.50**

WELDING KIT. Two 10 ft. leads, welding helmet, electrode holder, ground clamp. Sold only with welder at..... **$10.50**

Write for prices on A.C. Arc Welders.

6-pc. MAGNETIZED Screw Driver Set!

Permanently magnetized tempered and hardened tool steel blades. Plastic handles – unbreakable and shock-proof. Picks up and holds screw in tight spots. Makes impossible jobs easy. You get following types: Midget, stubby, close quarter, cabinet, thin blade, machinist, heavy duty, extra heavy duty. Fully guaranteed. Easily worth $4.95. Item 106; wt. 3 lbs. Special **$1.95**

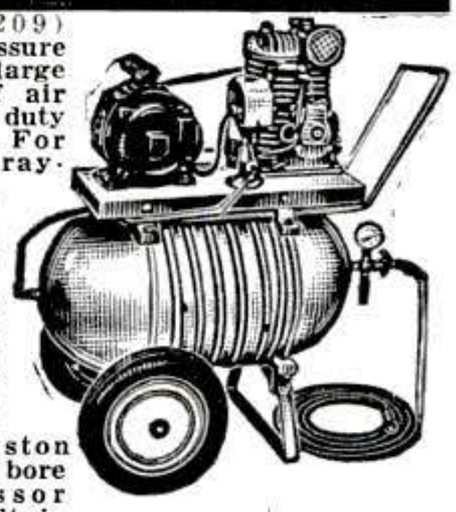
3-pc. ADJUSTABLE WRENCH SET

Made of finest steel alloy, chrome plated. Prices are exactly half actual value. Takes the place of a whole set of expensive tools. Packed in leatherette pouch.

Set A—4-inch, 6-inch, and 8-inch wrenches, (Item 107), wt 2 lbs., only **$2.95**

Set B—8-inch, 10-inch, and 12-inch wrenches, (Item 108), wt. 4 lbs., only **$6.45**

MASTER AIR COMPRESSOR



(Item 209) High pressure type for large volume of air for heavy duty service. For paint spraying, inflating truck and autotires, greasing, and the hundreds of other jobs done by compressed air. Piston type. 2" bore compressor with built-in air filter. Master built with hi-strength alloys and precision bearings. Stainless steel tank, 12"x24", 2100 cu. in. cap. Safe up to 500 lbs. Equipped with automatic switch that starts and stops motor to maintain desired pressure (up to 150 lbs.) and check valve, safety valve, gauge, shut-off valve, 20 ft. air hose and tire chuck. Beautifully balanced on ball bearing wheels and rubber tires. Low factory prices. With ⅓ hp. 110 v. A.C. motor (Reg. $175.00) (Item 209) **$98.50**
With ½ hp. motor. Reg. $199.50) (Item 209A)..... **$119.50**
With 2 hp Briggs Gas Engine (Reg. $199.50) (Item 209B) **$109.50**
Write for price of compressor only. A complete line of spray guns and air tanks available.

CARRY-AIR

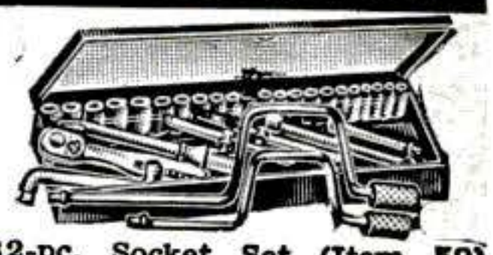
(Item 32)

Stainless steel tank—capacity 500 cu. in. at 400 lbs. press. complete with inlet and shutoff valves, press. gauge, detachable air hose, tire chuck. Fill at any service station. Carry air for tire inflation, blowing out lines, etc. One emergency pays back cost. Wt. 10 lbs. Worth $20.00. Our price.....**$8.95**
(Item 55A) **GIANT TANK,** size 12x24, 2100 cu. in. **$16.95**

Factory Prices on Catalog Items

Send 10¢ for **BIG 1953** catalog. **Hundreds of bargains**

32 Pc. SOCKET SET



32-pc. Socket Set (Item 59) Highest quality guar. non-breakable sockets made by Husky. Beautiful, matched chrome alloy, absolutely the best. Complete range of 21 sockets from ¼" thru 7/16" in ¼" drive and 7/16" thru 1-1/16" in ½" drive; 2 extensions, reversible ½" ratchet, adaptor bit, slide head, all angle coupling, 2 end wrenches, ½" speeder handle and sturdy metal tool box. For prof. mechanics who want the best. Wt. 14 lbs. Easily worth $41.50. While they last only..... **$16.95**

45 Pc. SOCKET SET

(Item 205) Contains a complete set of sockets in ½" drive, ⅜" drive and ¼" drive, plus all necessary extensions, handles, speeders, reversible ratchets, etc.; all uncond. guaranteed against breakage. Beautiful matched chromed thin wall alloy sockets in a sturdy handsome steel tool box. Wt. 17 lbs. List price $62.90. Factory Special.....**$26.95**

HYDRAULIC JACKS

Heavy duty, precision built, smooth, positive acting with built-in relief valve. Hi-Lift with screw extensions. Govt. surplus at a fraction of orig. cost. (Handle included.)
1½ ton (Item 208) Wt. 11 lbs..... **$6.45**
3 ton (Item 208A) Wt. 15 lbs.. **$9.45**
5 ton (Item 208B) Wt. 17 lbs..... **$11.45**

EXTENSION CORD

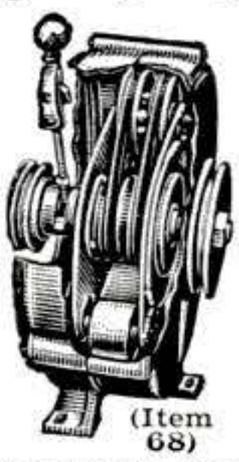
(Item 16) 40 ft. heavy duty, made of specially insulated No. 14 2-conductor wire. So tough that you can drive over it and yet flexible and easy to handle. Resists oil, grease or water. Extends electricity up to 400 ft. without voltage drop. Use indoors or out. Complete with heavy rubber plug and outlet. Wt. 2½ lbs. Usually $4.50—Special 40 ft.....**$1.99**
Comb: 2-40 ft. and 1-20 ft. (total 100 ft.).....**$4.95**
100 ft. length (one piece) **$4.85**
WIRE ONLY (Item 50)
No fittings. 100 ft..... **$4.00**

Heavy Duty Power Cable

#12—2 Cond.—stranded, very flexible, rubber covered, special outside conductor for grounding power tools, etc. Finest heavy duty power cable made. 50 ft. (Wt. 8 lbs.) Item 199..**$6.95**
100 ft. (Wt. 16 lbs.) Item 200.....**$12.95**

NEOPRENE POWER CABLE
#14-2 conductor, in a flexible Neoprene jacket. Wt. 9 lbs. 100 ft. Item 185.....**$9.95**

Variable Speed Selector



(Item 68)

Heavy duty, made by **B. F. GOODRICH** for industrial use. Provides instant speed changes for any drive. For machine tools, dryers, printing, conveyors, production lines, hoists — any operation requiring variable speed. Ideal for midget autos. Employs reliable "trouble free" planetary system. No hydraulic power losses or creeping. Infinite range, smooth operation, easy installation (data included). 3 sizes: ½-1 hp. wt. 36 lbs.; 1-2 hp. wt. 55 lbs.; 2-3 hp. wt. 105 lbs. Reg. list $228, $252 and $352. Our prices . . . **$79.50, $89.50** and **$114.50.**

Prices f.o.b. Factory. 10 day Money back guarantee. Send check or Money Order
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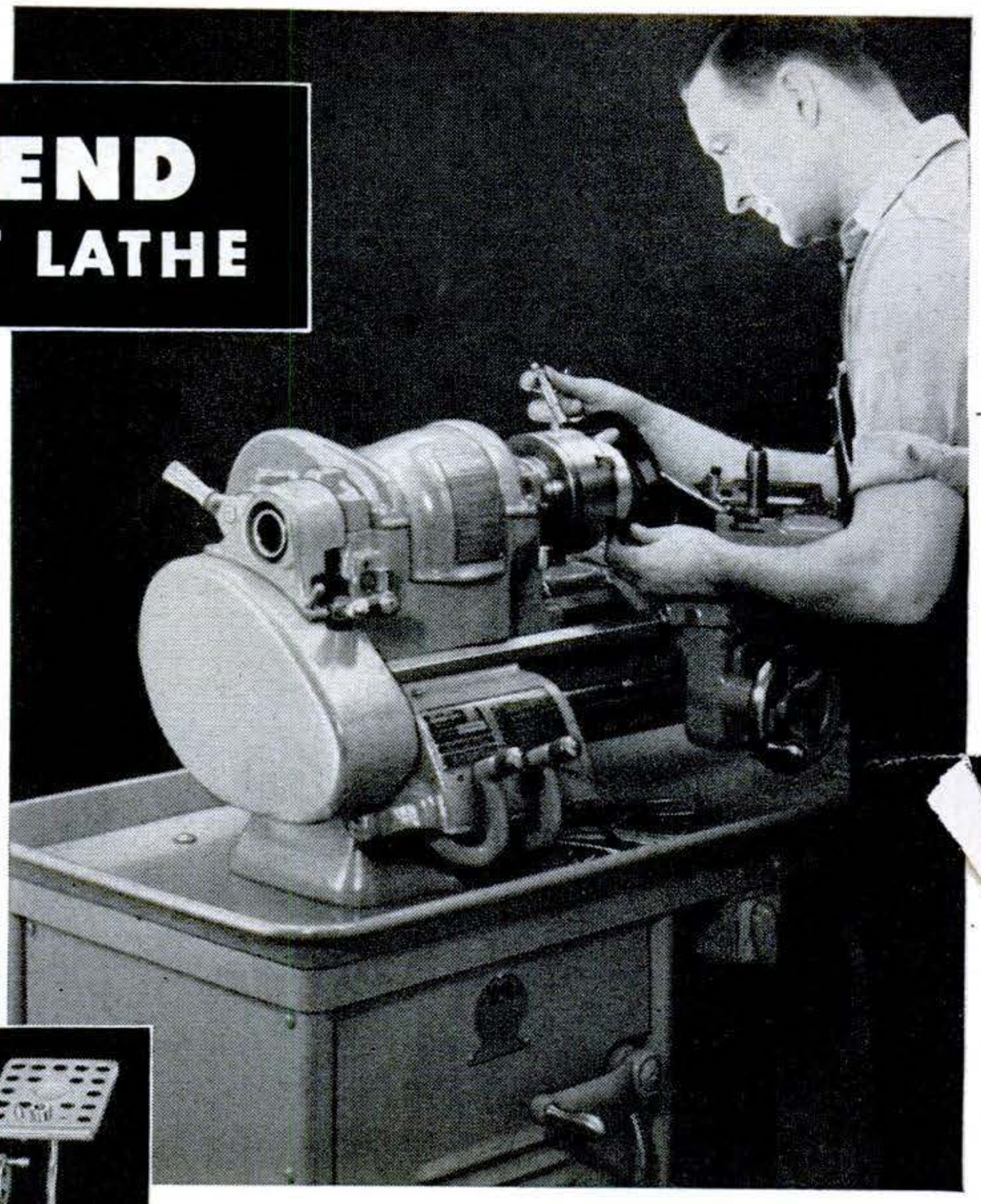
SOUTH BEND
10"-1" COLLET LATHE



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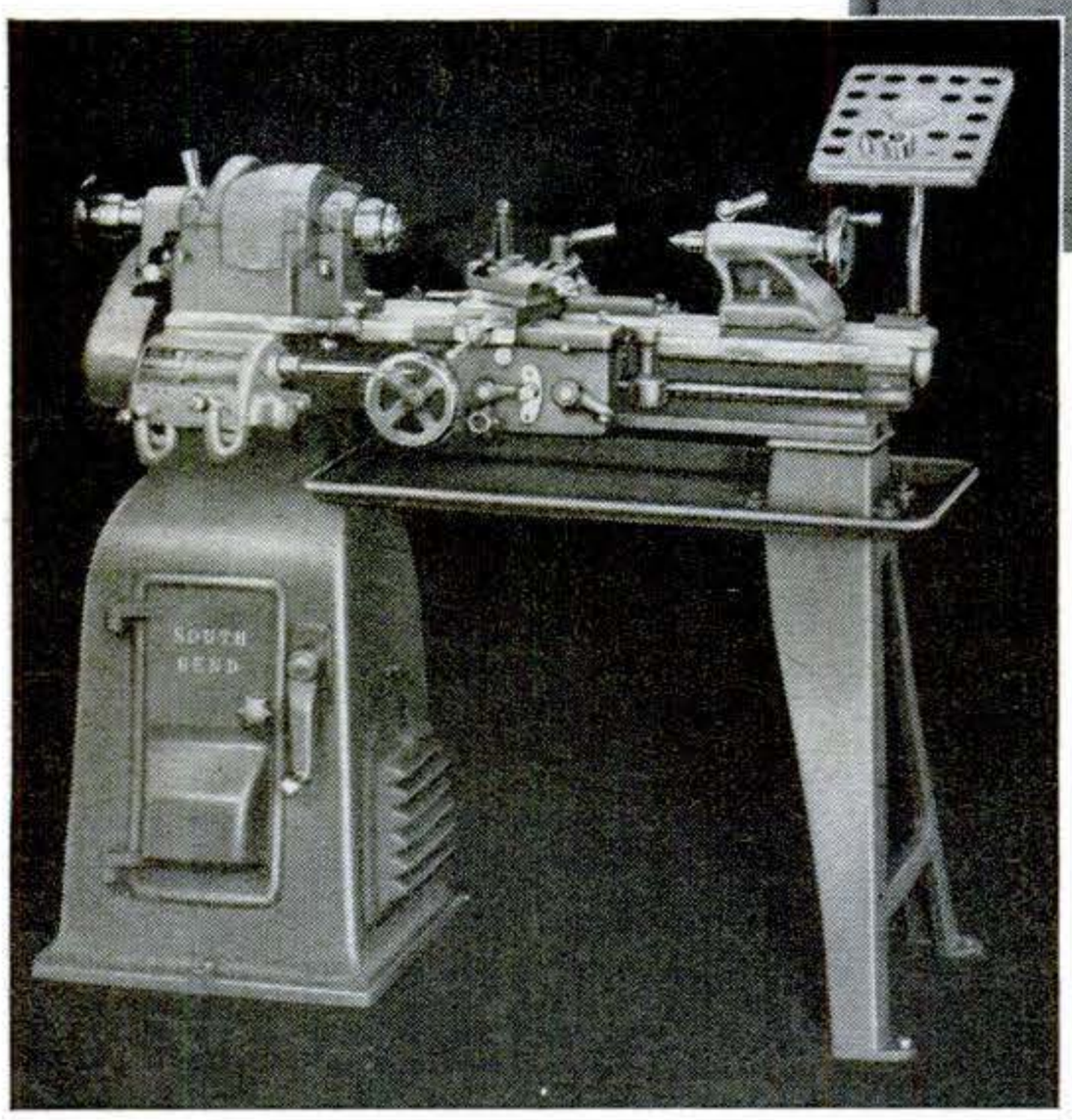

Built for exacting industrial work, the South Bend 10"-1" collet lathe satisfies the demands of any craftsman. Its accuracy simplifies precision jobs and permits work of the highest professional quality. This is the perfect tool for shop owners who want accuracy and versatility. Write for literature on the 10"-1" collet lathe and its many attachments.

SEND INFORMATION CHECKED:

☐ _____

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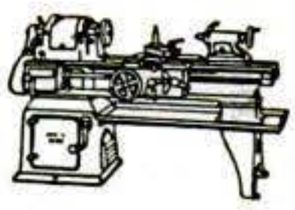
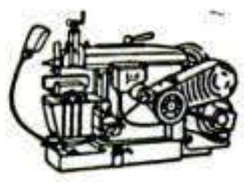
☐ 9" and 10" BENCH LATHES



☐ 10" to 16-24" FLOOR LATHES

☐ ½" and 1" Collet TURRET LATHES

☐ 14" DRILL PRESSES



☐ 7" BENCH SHAPERS

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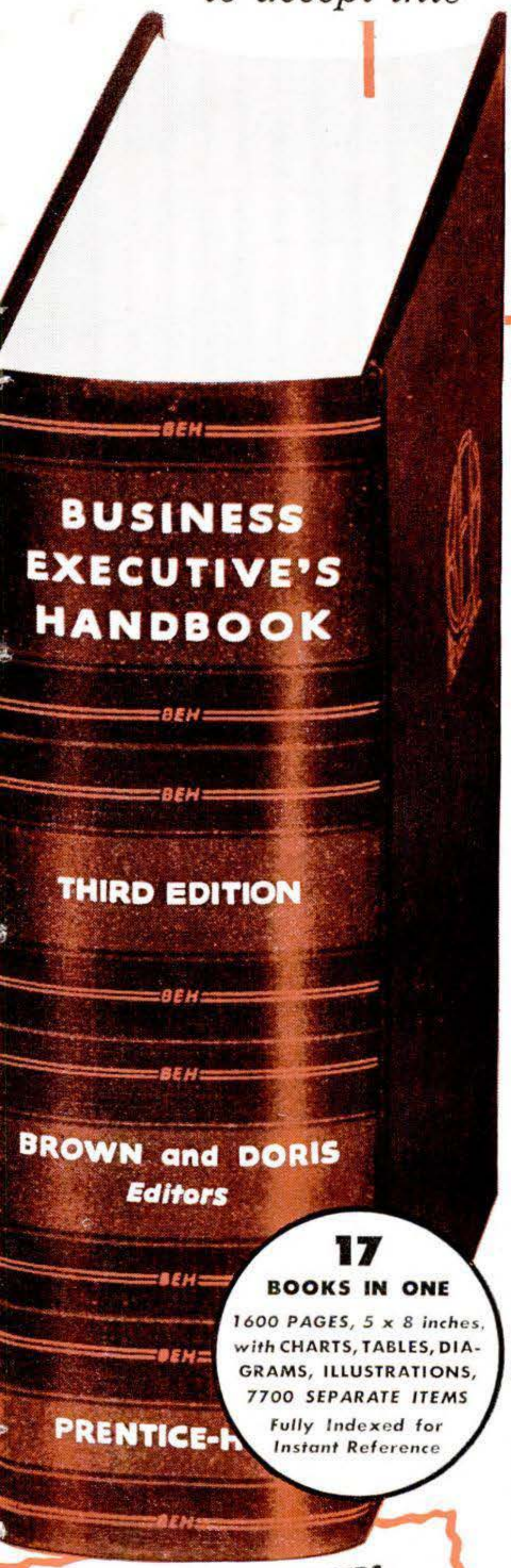

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THE DOLLARS AND CENTS OF BUSINESS: A real executive knows how to "figure"—knows short-cuts in business mathematics that make him a quick thinker in a business deal. This section of the Handbook shows you: how to calculate simple and compound interest; bank discount; savings through cash discount; trade discounts; averages; markup and selling price; annuities; sinking funds and amortization; depreciation; freight rates; verifying by check numbers; tables of weights, measures and values; miscellaneous tables.

WRITE BETTER LETTERS: Can you put your ideas across "on paper"? This section of the Handbook covers: a plan to improve letters; compiling a correspondence manual; letter-appraisal chart; tone and spirit of the letter; how to answer an inquiry; letters refusing requests; letters to revive inactive accounts; letters that build goodwill; how to answer complaints; legal aspects of business letters; mechanics of the letter; special forms of address; dictionary of correct usage.

HOW TO SELL BY DIRECT MAIL: What products can be sold? What are the steps in planning direct-mail selling? Here is expert guidance on: selecting lists; types of direct mail; self-question chart of direct advertising; testing direct mail; how to record results; how to get and build mailing lists; how to write sales letters.

HELPFUL FACTS ABOUT ADVERTISING: Facts for small advertisers; developing demand; how to work with an advertising agency; fixing the advertising appropriation; selecting the right media; testing your advertising; how to design and register a trade-mark; copyright procedure; printing and typography.

MANAGING SALESMEN: If you are ever required to build and manage a sales force, turn to the Handbook for useful facts on: determining sales territories; sales quotas; recruiting and selecting salesmen; equipping, training and compensating salesmen.

SALES CONTRACTS AND FORMS: Essentials of a contract; when a sales contract must be in writing; forms of contracts for sale of merchandise; conditional sales contracts; lease agreement; miscellaneous clauses in sales contracts; contracts appointing agents for sale of merchandise; miscellaneous clauses in agency agreements; contracts employing salesmen; special provisions in salesmen's contracts; foreign trade definitions.

HINTS ON BUYING MERCHANDISE: Buying the right thing; how to standardize specifications; buying the right amount at the right place, at the right time, at the right price; procedure for handling and analyzing bids; requisitions and purchase orders; receiving and inspecting incoming goods; checking invoices; stores and inventory control.

HOW TO MANAGE AN OFFICE: Do th little details of office routine "throw" you? Her is a commonsense road-map to follow when yo need help on: planning and maintaining the office for efficiency; equipment, files and appliances making office procedure function smoothly; econo mies in the use and printing of forms; hiring an training new employees.

HOW TO CHECK CREDITS AND INCREASE COLLECTIONS: Sources of credit information; Dun & Bradstreet reports; special agency reports credit interchange; salesmen, attorneys and bank as credit references; law relating to checks, notes drafts or bills of exchange; how to write letter granting or refusing credit; how to write col lection letters and reminders; form collectio letters.

HOW TO DEAL WITH THOSE WHO OWE YOU MONEY: Collection of a claim by suit or the unpaid obligation; out-of-court agreements; as signment for benefit of creditors; equity receiver ships; voluntary or involuntary petition in bank ruptcy; corporate reorganizations; wage earners plans.

FINANCIAL STATEMENTS: Do you know how to read a balance sheet? The Handbook tells you the meaning of: current assets; fixed assets or fixed capital; tangible fixed assets; investments; deferred charges; current liabilities; fixed liabilities; deferred credits; contingent liabilities; reserves; capital stock; surplus.

BUSINESS INSURANCE: How to reduce the cost of ample insurance protection; law governing insurance policies; types of policies; fire, burglary, theft, robbery insurance; fidelity and surety bonds; credit insurance; miscellaneous coverages; business insurance; group insurance.

DIRECTORS, OFFICERS, STOCKHOLDERS: Law relating to directors; removal of director with or without cause; liability of director for acts beyond corporate powers; law relating to officers; liability of an officer for mismanagement; rights, liabilities of stockholders.

CORPORATE MEETINGS, MINUTES AND RESOLUTIONS: Preparations for meetings; stockholders' meetings; directors' meetings and committee meetings; how to keep minutes of meetings; parliamentary procedure.

PARTNERSHIPS: What a partnership agreement should contain; division of profits and losses among partners; liability of a secret partner; power of a partner to borrow money, collect debts, employ assistants, purchase and sell property; liability of an incoming partner; changing to a corporation.

TYPES OF BUSINESS ORGANIZATIONS: Choosing a form of organization for a business; raising of additional capital; power to do business in any state; choosing a name under which to do business.

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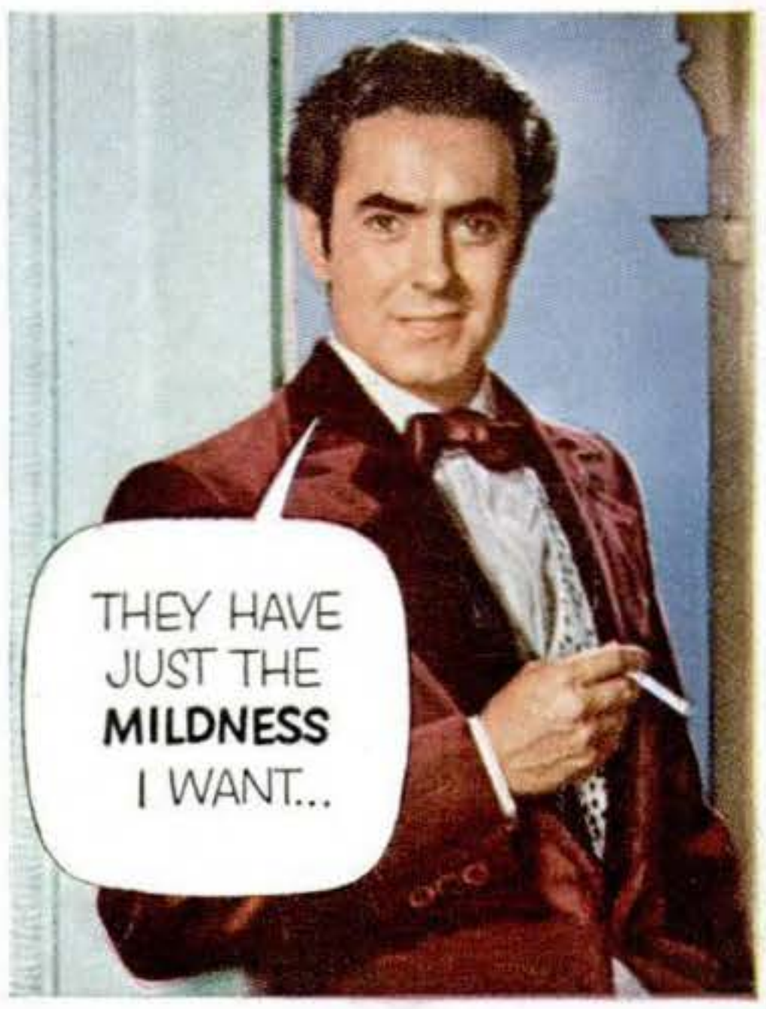
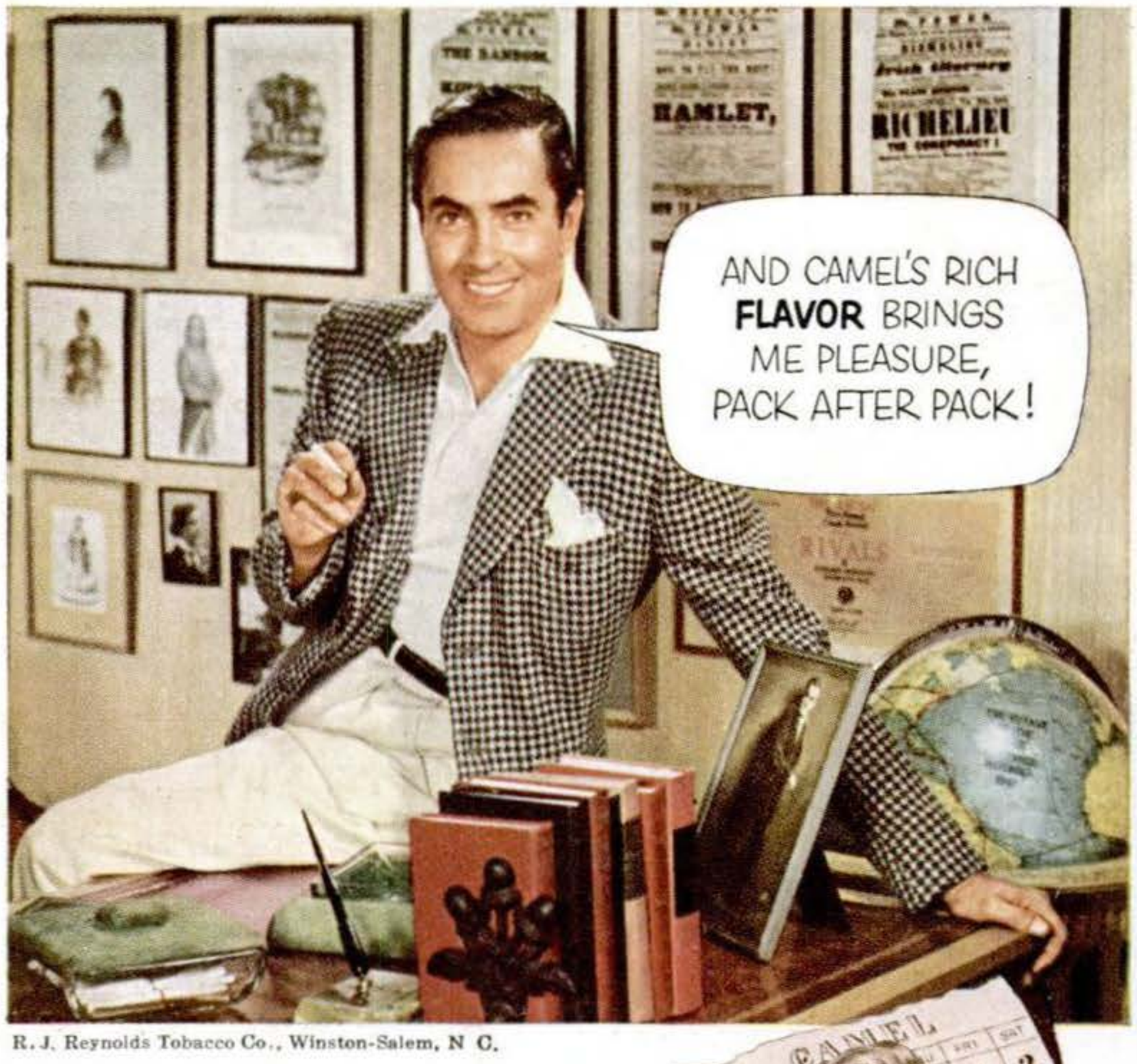


TYRONE POWER, Star of "Mississippi Gambler", photographed on the set



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